SARAS CALL h2020-ICT-2016-2017
INFORMATION AND COMMUNICATION TECHNOLOGIES

SARAS

"Smart Autonomous Robotic Assistant Surgeon"

D8.2 –Plan for Exploitation and Dissemination (Y1)

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Dissemination Level	
PU = Public, fully open, e.g. web	✓
CO = Confidential, restricted under conditions set out in Model Grant Agreement	
CI = Classified, information as referred to in Commission Decision 2001/844/EC.	
Int = Internal Working Document	

D8.2 –Plan for Exploitation and Dissemination (Y1)

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Contents

List of acronyms

CEB	Common Exploitation Booster
CM	Communication Manager
D8.1	D8.1_PlanForCommunicationActions
HP	Home Page
IAB	Industrial Advisory Boards
IDM	Innovation & Dissemination Manager
IDS	Innovation Disclosure Process
KER	Key Exploitable Results
LSM	Lean Startup Methodology
PMT	Project Management Team
TTO	University Technology Transfer Offices
WP	Work package

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Executive Summary

SARAS - Smart Autonomous Robotic Assistant Surgeon – The Project aims at developing the next-generation of cognitive autonomous system for solo surgery that will allow a single surgeon to execute Robotic Minimally Invasive Surgery (R-MIS) without the need of an expert assistant surgeon.

The project has received funding from the European Union's Horizon 2020, the biggest EU research and innovation programme ever. Horizon 2020 is a Research and Innovation programme aiming at fostering competitiveness and growth and increasing benefits to the European Union's economy and citizens. Public investment in projects is to be converted into socio-economic benefits for the wider society, as clearly indicated in the Horizon 2020 Rules for Participation[1], with a clear stress on the beneficiaries' obligations to exploit and disseminate the outcomes of the funded activities.

The Plan for the Exploitation and Dissemination of Results is a document which summarizes the beneficiaries' strategy and concrete actions related to the protection, dissemination and exploitation of the project results.

1.1 *The structure of the document*

The document is structured into three parts, a generic chapter on Dissemination & Exploitation and two specific ones on SARAS' Dissemination and Exploitation.

Part one starts with a short description of what Dissemination and Exploitation are, with a particular note about their importance in the Horizon 2020 Programme, their objectives and Partner responsibilities.

The second part is specifically devoted to SARAS' Dissemination and describes the process adopted to promote the project's results and how all partners can contribute to promote them, as well as the strategy to make them available to a scientific audience, the specific objectives and proper media mix to reach the goals.

Part three has the same structure of part two, but is related to SARAS' Exploitation. The strategy section includes audience definition, objectives and the media mix deemed ideal to raise awareness among potential commercial partners. Here the plan section includes two possible approaches describing how the IDM can help partners write individual plans and create a global one by month 24/36.

In the Annex an overview of the report of Year 1 Communication Plan can be found, with the main actions conducted so far. A Year 1 Dissemination Report concludes, with a list of all the activities run during the first year.

[1] http://ec.europa.eu/research/participants/data/ref/h2020/legal_basis/rules_participation/h2020-rules-participation_en.pdf

DISSEMINATION & EXPLOITATION

1.2 *Description*

The terms "exploitation" and "dissemination" are defined under the Horizon 2020 Rules for Participation[2] as follows:

- Dissemination - "is the public disclosure of the results by any appropriate means (other than resulting from protecting or exploiting the results), including by scientific publications in any medium";
- Exploitation - "means the use of results in further research activities other than those covered by the action concerned, or in developing, creating and marketing a product or process, or in creating and providing a service, or in standardization activities".

All Dissemination and Exploitation activities are part of Work Package (WP) 8, entitled Communication and exploitation, starting month 1, ending month 36. This WP aims at: organizing the envisaged communication activities; monitoring the progress of the dissemination activities; defining the exploitation strategy of the project's results.

This WP is led by OSR (Ospedale San Raffaele). In particular, SARAS has appointed a Communication Manager (CM) responsible for writing the project's Communication and Dissemination Plans and carrying them out throughout the project's lifetime, plus drafting the Exploitation plan to help exploit the project's results through the official SARAS' media.

An Innovation and Dissemination Manager (IDM), Stefano Fabrizio Grassi, chair of and supported by the Industrial Advisory Boards (IAB), as well as member of the Project Management Team (PMT), has been appointed with the objective of successfully exploiting, developing and promoting innovations based on the project outputs, finding the best way for initiating the technological transfer required for business implementation[3].

The Industrial Advisory Board (IAB), whose task is to advise on quality of project results, broader societal views, and their practical applicability; on dissemination, implementation and exploitation of results, is comprised of the chair, an industrial experts, Dr. Matthias Peterhans - CAScination, and a representatives of the academic community, Prof. George Mylonas.

All SARAS Consortium members will have to perform dedicated dissemination activities at country level and abroad. All partners will also leverage their country networks and contacts for exploitation purposes.

1.3 *Objectives*

The *Dissemination & Exploitation Plan* will be implemented to provide information, receive feedback and engage in a dialogue the relevant stakeholders involved in the project's activities. The final goal is for SARAS' platforms to be widely known and hopefully adopted by European hospitals. For other target groups[4], identified in deliverable D 8.1 – Plan for Communication actions, the goal consists in creating interest in the system solution.

Communication activities are mainly meant to raise the interest of and engage different stakeholders. Preliminary activities are aimed to identify the key messages, ambitions, objectives, concepts and

[2] https://www.iprhelpdesk.eu/glossary

[3] See Grant Agreement-779813-SARAS PART B page 40-47

[4] General Public, Healthcare Experts, Researchers, European companies

goals of the project and to prepare general materials, such as the official website, press releases and news, a project blog, videos and posts on social media, posters and presentations.

Results Dissemination is a peer-based communication taking place the academic world, mainly from researchers to researchers, and consists in providing the main technical outcomes, such as data, achievements and conclusions. These are spread through publications, articles and papers posted on the official website, journals and books or presentations and posters presented at conferences.

Exploitation activities aim to foster market awareness, to offer a product or a solution to end-users or companies, leveraging the effects generated by the communication and dissemination activities. Exploitation consists in the commercialization of the outcomes together or through industrial or commercial partners. To this purpose all the media previously mentioned in the Communication and Dissemination plans are used, with in addition exhibitions, fairs, open innovation communities, networking, call for ideas events and business angels.

Here follows (see Figure 1) a scheme that graphically explains the differences between Communication, Dissemination and Exploitation, highlighting objectives, audiences, contents and media:

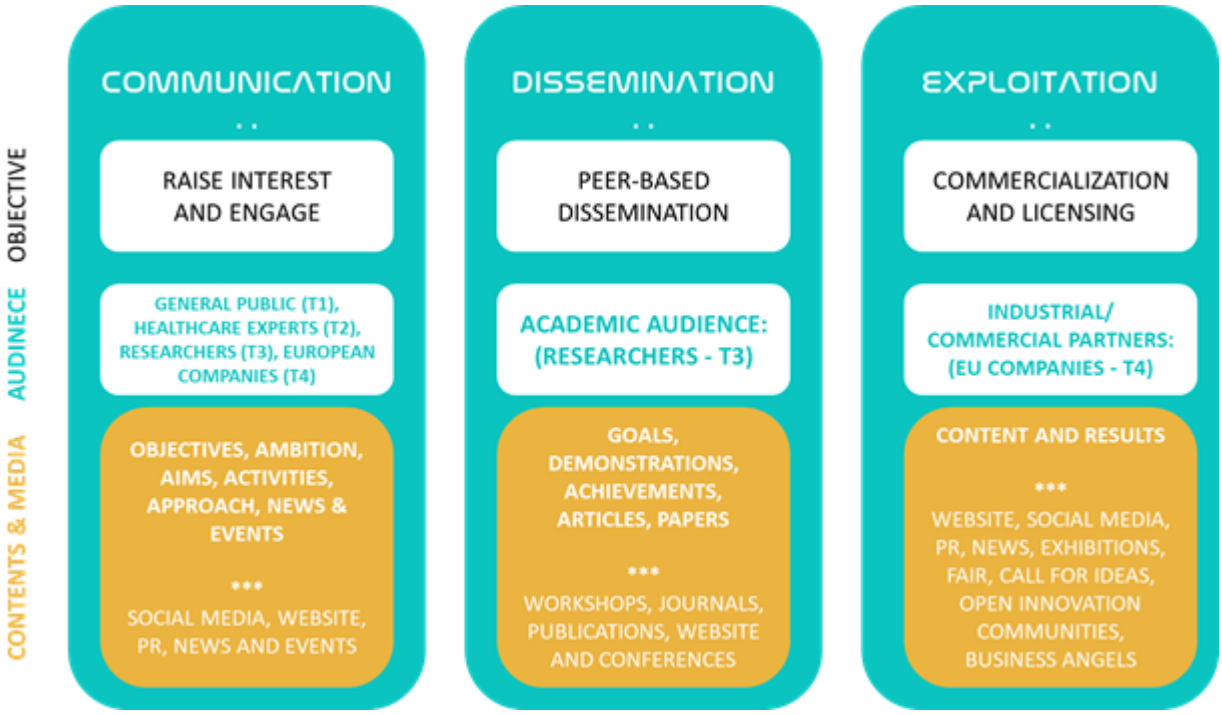


Figure 1 - Communication - Dissemination - Exploitation differences

1.4 *Partners' responsibilities*

All SARAS' partners must contribute to disseminate and exploit the results of the project.

In detail, each partner will be responsible for:

1. Preparing its own Dissemination & Exploitation plan;
2. Informing and sending to the Communication Manager any activity developed within the framework of the project, related details and necessary information. Some example are:
    a. posters, presentations, demos presented in conferences, seminars or workshops;

   b. papers/articles/proceedings published;
   c. events/workshops and lectures invitation/participation and organization;
3. Keeping a fluid communication with the CM through the Excel file named "Dissemination_Calendar-xx" (see Figure 3), shared by email and always available for all partners on the project cloud repository;
4. Adding the project's logo and EU emblem[5] in all dissemination and exploitation materials.

The CM, on their part, will be in charge of:

1. Collecting all Publications and uploading them on the SARAS website, plus adding them on the ZENODO platform if the PDF has been provided and they are Open Access;
2. Collecting attendance to conferences and events and publishing all available information, whenever relevant;
3. Informing consortium members about important aspects related with this WP

[5] High-resolution EU emblems are available here: https://europa.eu/european-union/about-eu/symbols/flag_en

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 779813 (SARAS).

SARAS' DISSEMINATION

Dissemination (or publishing) refers to the public disclosure of results by any appropriate means, except those resulting from protecting or exploiting the results[6]. Dissemination stimulates further research and development, the rationale for IPR, and exploitation use[7].
Scientific publications, general information on web sites, participation in conferences are all examples of dissemination activities.

'Dissemination plan' refers to the process of making the results of a research project available to a scientific audience. Dissemination is essential for taking-up crucial elements for the success of a project and for the sustainability of the related outputs in the long term view.
The main objective of dissemination remains to raise awareness among researchers.

1.1 *Dissemination process*

If the project generates outcomes the next step is to write up a report that describes the experiment, the results and the research ideas. Any scientific paper/conference abstract should be submitted to **the IDM and the entire consortium** by providing title and abstract.

Authors who are proposing the scientific paper/conference abstract should propose a **list of authors/partner participants** from the Project Consortium.

Co-authors choose an appropriate journal or conference to which submit the manuscript. The venue's scope should match what reported, so that the audience will be interested in what written.

The submitted paper is subject to the editors and the peer reviewers' scrutiny. If deemed of sufficient interest it is then published as article.

At this point Dissemination can start and one of the authors must inform and provide details to the Communication Manager, who is now allowed to disseminate the publication

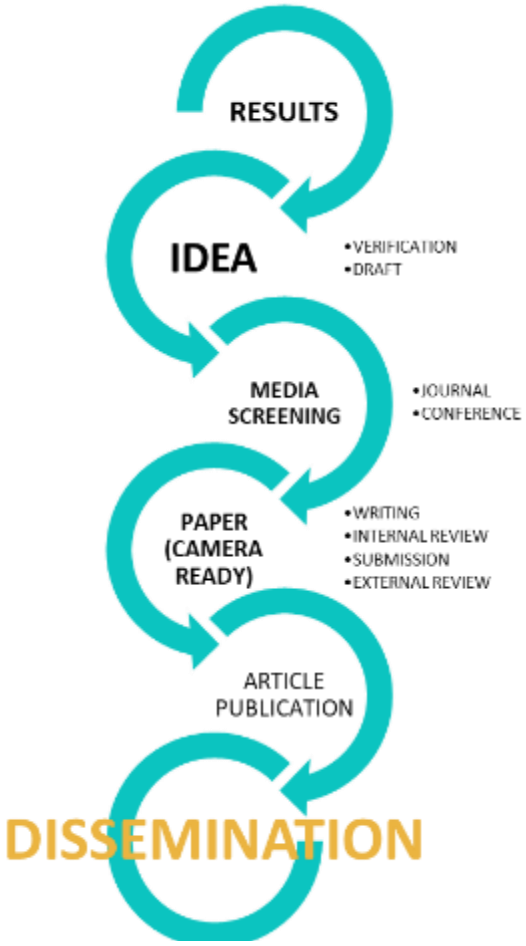


Figure 2 - Dissemination Process

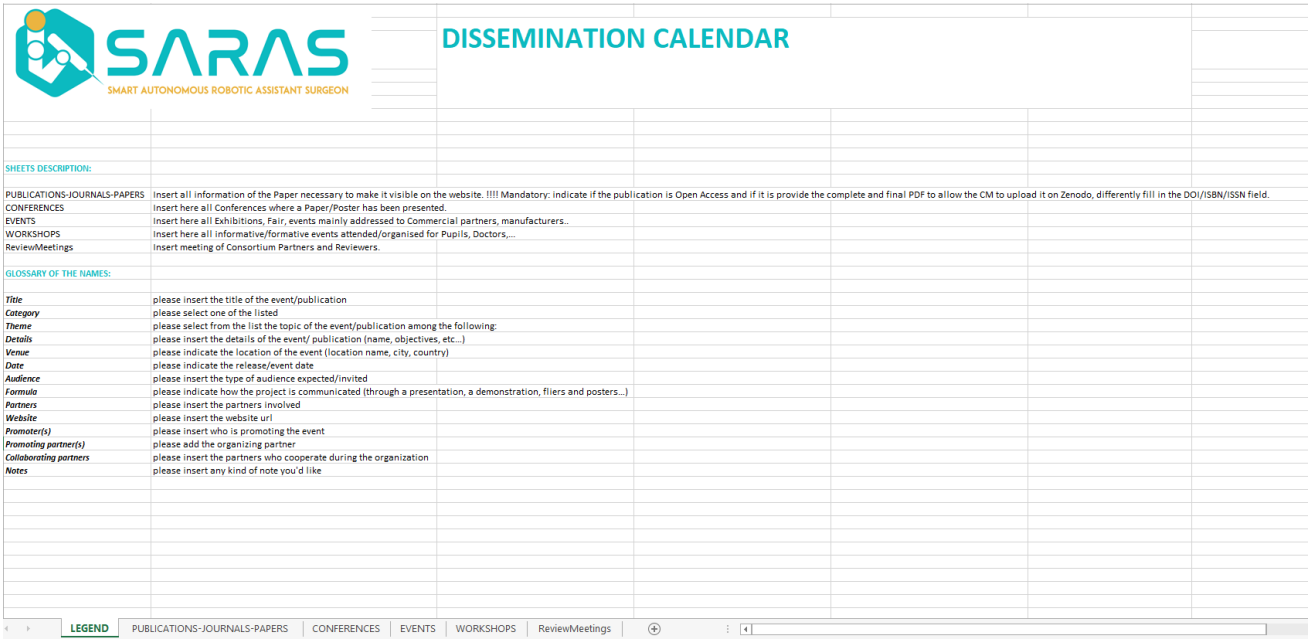
[6] http://ec.europa.eu/research/participants/portal/desktop/en/support/reference_terms.html

[7] https://www.iprhelpdesk.eu/sites/default/files/events/04%20Preparing%20Proposals%20and%20Managing%20Projects.pdf

according to the Communication Strategy laid out in "D8.1_PlanForCommunicationActions".

To disseminate publications the CM must be alerted by Partners and provided with all the useful information. To ensure a smooth communication and, whenever possible, to provide information of any dissemination and exploitation activities developed within the framework of the project, as well as to avoid losing information, a procedure has been designed in D8.1, presented to the partners during the first Project Meeting held in Barcelona in September the 25th, sent via email and uploaded on the Project Cloud Repository.

The procedure consists in periodically updating an excel file named "DISSEMINATION_Calendar_final-xxx" and alerting the CM about changes via email.


SARAS
SMART AUTONOMOUS ROBOTIC ASSISTANT SURGEON

DISSEMINATION CALENDAR

SHEETS DESCRIPTION:

PUBLICATIONS-JOURNALS-PAPERS	Insert all information of the Paper necessary to make it visible on the website. !!!! Mandatory: indicate if the publication is Open Access and if it is provide the complete and final PDF to allow the CM to upload it on Zenodo, differently fill in the DOI/ISBN/ISSN field.
CONFERENCES	Insert here all Conferences where a Paper/Poster has been presented.
EVENTS	Insert here all Exhibitions, Fair, events mainly addressed to Commercial partners, manufacturers..
WORKSHOPS	Insert here all informative/formative events attended/organised for Pupils, Doctors,...
ReviewMeetings	Insert meeting of Consortium Partners and Reviewers.

GLOSSARY OF THE NAMES:

Title	please insert the title of the event/publication
Category	please select one of the listed
Theme	please select from the list the topic of the event/publication among the following:
Details	please insert the details of the event/ publication (name, objectives, etc...)
Venue	please indicate the location of the event (location name, city, country)
Date	please indicate the release/event date
Audience	please insert the type of audience expected/invited
Formula	please indicate how the project is communicated (through a presentation, a demonstration, fliers and posters...)
Partners	please insert the partners involved
Website	please insert the website url
Promoter(s)	please insert who is promoting the event
Promoting partner(s)	please add the organizing partner
Collaborating partners	please insert the partners who cooperate during the organization
Notes	please insert any kind of note you'd like

LEGEND | PUBLICATIONS-JOURNALS-PAPERS | CONFERENCES | EVENTS | WORKSHOPS | ReviewMeetings

Figure 3 - Dissemination Calendar File

The Dissemination Calendar Excel file is quite intuitive and structured into 6 Sheets, labeled as follows:

1. LEGEND: a Sheets description and a Glossary guides Partners filling in the file.
2. PUBLICATIONS-JOURNALS-PAPERS: Insert all information on the Paper required for publication on the website.
    a. Paper main information: title, date of publishing, authors, the abstract, keywords, editor and so on;
    b. Type of publication
        i. BOOK= Book/Chapter
        ii. PAPER= Proceeding/In proceeding/Conference Paper
        iii. JOURNAL= Journal/Article
        iv. THESIS= Master Thesis
    c. Mandatory: indicate if the publication is Open Access, and if it is provide the complete and final PDF to allow the CM to upload it on Zenodo, differently fill in the DOI/ISBN/ISSN field;

   d. The Column O “Status of Publication” is filled in by the CM to keep track of what has been uploaded and when.
   e. The third area in orange contains extra information related to the article, such as the Conference Name, the Publisher, the Series or the Volume where it appeared...
3. CONFERENCES: Insert here all Conferences where a Paper/Poster has been presented.
4. EVENTS: Insert here all Exhibitions, Fair, events mainly addressed to Commercial partners, manufacturers...
5. WORKSHOPS: Insert here all informative/formative events attended/organized for Pupils, Doctors...
6. Meetings: Insert meetings of Consortium Partners and Reviewers meetings.

The file is also available in the Project Cloud Repository in the “00.FILE to PUBLISH” folder, whose contents are listed in the following:

- the Dissemination Calendar excel file to fill in (see Figure 4);
- a PDF named “Communication_Dissemination_HOWtoContribute”, which the Communication Manager presented at the Barcelona Project Meeting, describing the procedure for Partners to actively contribute maximising the impact of the project and disseminating results;
- a folder named “Publications PDF” where to upload all PDFs of Open Access Papers.

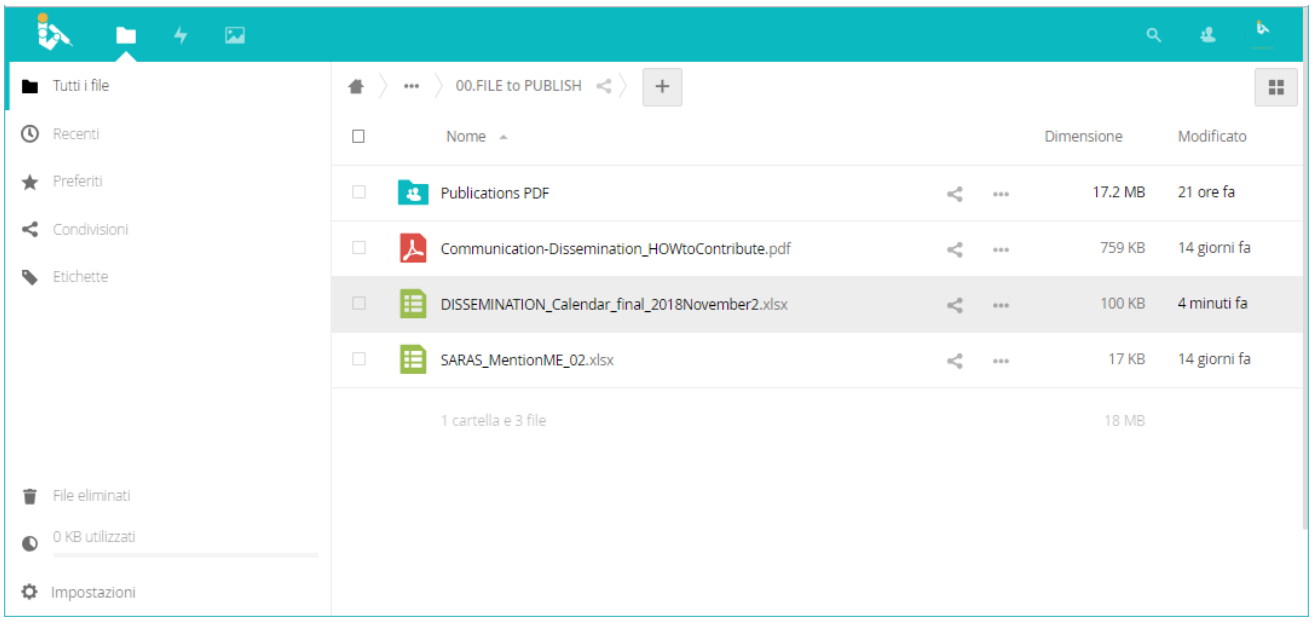


Figure 4 - Cloud Repository Folder FILE to Publish

1.2 *Dissemination strategy*

The Dissemination Strategy, included in D8.1 and here summarised, describes how making the results and deliverables of a project available to scientific audience. Such a Strategy is crucial for the success of a project and for the sustainability of its outputs in the long term view. It defines:

- The audience of interest;
- The objective(s) of the dissemination;
- The contents of most interest for the target audience;
- The channels to be used to achieve the target.

1.2.1 Audience

The target audience identified for the dissemination is the researchers' community.

Researchers are all familiar with European grants, research projects and use the very formal academic language; they read papers, journals and technical documents about different topics, as among which **surgical robotics**, **computer vision**, **machine learning and artificial intelligence.**

Geographically, they are located both inside and outside Europe, but we will pay particular attention to SARAS Partners' local markets: Italy, Spain, UK, Germany and Austria.

1.2.2 Objective

The Objective of SARAS dissemination is to engage and encourage participation in research, to educate and inspire the next generation of scientists in order to expand the European network of researchers in the field of cognitive robotics and autonomous robots.

1.2.3 Content & Channels

The ideal media mix to get in contact with Researchers and maximize the dissemination effects is a composition of the following channels:

1.2.3.1 SARAS Website

We have created a specific area, reachable from the main menu of the SARAS website, named "Publications" where to place all published output. A special plugin of WordPress named *teachPress* has been installed to easily manage courses, enrollments and publications and keep a similar structure used in other Projects' websites.

All Publications, book and **articles** that, at the discretion of the partners, are notified to the CM will be:

- Added on the website in the "Publications" area
- (if Open Access and with PDF provided) deposited on Zenodo, an Open Access Portal
- (optional) published as a news in the website dedicated area termed "News"
- (optional) added in the "Highlights" area in the Home page of the website
- (optional) posted on social media
- (if presented at an event) inserted in the related event page
- (if a video of the presentation exists) added to the Videos section and to the official channel of the Project on YouTube

Website URL: http://saras-project.eu/

1.2.3.2 Social Media

- **YouTube:** An official channel for the project "SarasH2020 "has been created (see Figure 5)
  Channel page: https://www.youtube.com/channel/UCh3x52tiWIs8dsUTbiYNuDw

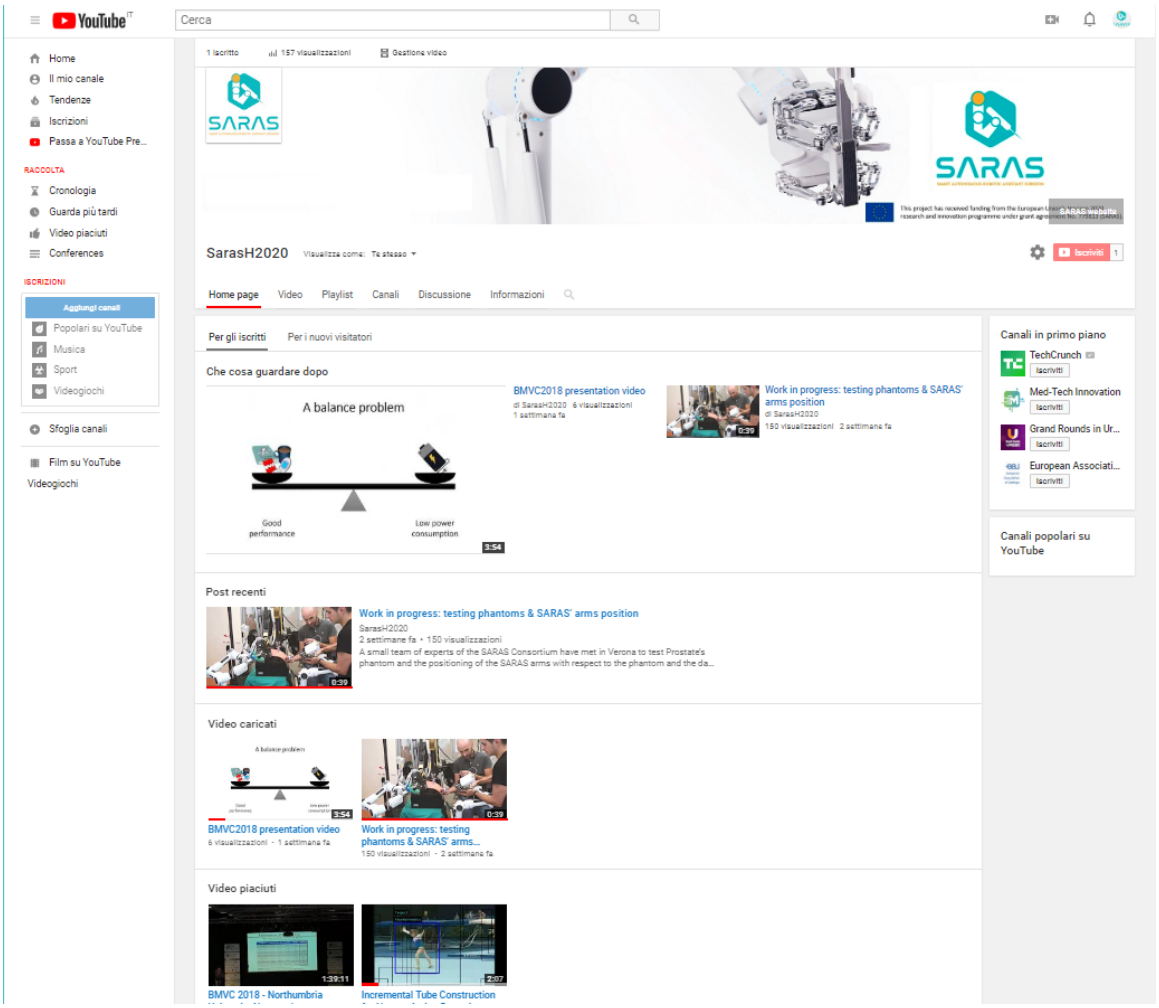


Figure 5 - SARASH2020 YouTube Channel

- **Twitter**

  Twitter is the social media of choice for communicating the results of a research activity, sharing resources, promoting events and publications, building online communities, connecting with people and communicating with followers.

  On Twitter 65% of users are under the age of 34[8].

  It is mainly exploited to expand one's audience using links to valuable content and to redirect them to a landing page of the official website.

  Profile page url: https://twitter.com/SarasH2020

[8] Statistics on The 2018 Social Audience Guide https://www.spredfast.com/social-media-tips/social-media-demographics-current and https://blog.hootsuite.com/social-media-demographics/

1.2.3.3 Events

Various types of events may be considered depending on audiences, objectives, budget and topics. For Dissemination purposes we consider relevant the following:

1. **Conferences** are the best way to meet peers in person, they can help gaining connections and nurture collaborations; popular in the academic and medical fields.
2. **Workshops and Seminars** are informative/educational events for the demonstration of a product and/or the training of attendees.

1.3 *Dissemination Plan*

A plan is a list of detailed activities to conduct in a specific period with a specific purpose. However, since it is simply not possible to identify in the early stages of the research process what results will be generated in what period or whether a paper will be published, we are not going to draft a plan; we will instead present an annual report, that will be progressively and periodically updated (see Appendix B - Dissemination Report)

SARAS' EXPLOITATION

Exploitation (or use) can be commercial or research, and it means to make use of the results produced in the project in further activities other than those covered by the project, e.g. in other research activities; in developing, creating and marketing a product, process or service, in standardization activities[9].

Appropriate exploitation leads to innovation. It has become a crucial element in H2020 projects, and is therefore a mandatory activity and reporting item.

Exploitation of results can be performed either by single partners directly (e.g. for further research or for commercial or industrial exploitation in its own activities) or by others (other beneficiaries or third parties, e.g. through licensing or by transferring the ownership of results).

1.1 *Exploitation process*

The Exploitation process implies that the project consortia clarify issues, explore solutions and actions for successful exploitation, setting up roadmaps for the sustainability of the project results and creating value out of novel knowledge, such as creating revenues, improving skills, standardization or patenting, finding pathways for future work.

In this complex phase the IDM will support partners finding tools and consultants that may help them draft their own Key Exploitable Results (KER) and draw an individual strategy and plan.

To support Consortia in this phase the Directorate General for Research and Innovation offers on-demand services such as the Common Exploitation Booster (CEB)[10].

With the help of a consultant each Partner will have the ability to identify the potential innovations stemming from the project, to run a market analysis, to run a KER verification, validation and selection and to draw a Business plan to implement the first steps.

To move forward and maximise the outcomes of the project the Partners which identified one or more valuable KER(s) will then develop for each of them a go-to-market strategy.

The actions drafted in the preliminary plan will be transferred to the IDM and the CM to allow proper divulgation and communication.

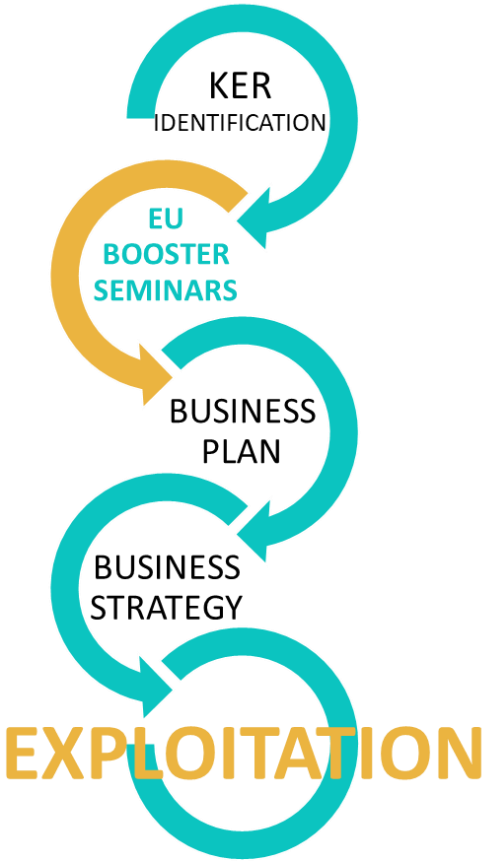


Figure 6 - Exploitation Process

Plans are periodically refined, as the key features and possible usage of SARAS implemented

[9] http://ec.europa.eu/research/participants/portal/desktop/en/support/reference_terms.html

[10] http://exploitation.meta-group.com/Pagine/About-Us.aspx

innovation become clearer. All valuable results will be included in the exploitation report, following the guidelines defined in the exploitation strategy.

1.2 *Exploitation strategy*

The Exploitation Strategy defines the guidelines for communicating the Consortia Business Outputs and defines:

- Audience(s);
- Objectives;
- Type of contents;
- Channels to use.

1.2.1 Audience

The Exploitation audience identified is: European companies.

These are manufacturers, investors, OEMS and Solution providers of both macro areas of Robotics and Healthcare; i.e. potential manufacturers of surgical robotic tools and of specific subsystems (software and hardware).

Business description: they mainly operate in the Medical and/or Robotics industry, but also in the Professional service robotics, Artificial Intelligence, Healthcare technology, Industrial robotics, Software & applications, and Internet of things sectors. Some are startups and/or spin-offs.

This cluster groups people that can read and use robotic-related medical terminology and technical jargon but use an informal register.

Geographically, we will be addressing our communication to European Companies, with a particular attention to our Partners' local markets: Italy, Spain, UK, Germany and Austria.

1.2.2 Objective

The objective of SARAS' exploitation is to open new markets in the European industrial world of surgical robotics, phantoms design and training, thanks to the enormous potential for SARAS-like systems in Europe.

SARAS pushes human-robot cooperation to a new level and it focusses on one of the key technologies of the Industry 4.0 program.

1.2.3 Contents & Channels

The ideal media mix to get in contact with European Companies in the medical-robotic industry is a composition of the following channels:

1.2.3.1 SARAS Website

Several areas in the website are designed to be useful for the industry:

- The home page (HP) has been structured to provide all immediate information to understand what the project aim is, for example in the *Saras at a Glance* section; scrolling down the HP we find the *News* section that contains the most relevant updates on the project, such as progress, results, and blog posts; the *Testimonials* area is also functional to attract potential commercial partners.
- The *Project* area has been specifically design for the industry with its sub-menus describing the project *Objectives*, *Concept and Approach*, *Ambition* and *Impact*.

- The *News* area is multifunctional, but since it is written in a journalistic style it facilitates the reading and finding of contents of interest; the page is enriched with a right column all dedicated to contents, where users can find all recent posts from official social medias, the TAG cloud that helps finding specific topics by clicking on terms and the latest news section.
- The *Event* area may help industry participants find and reach us at congress, exhibitions and other international events.
  Website Page: http://saras-project.eu/

1.2.3.2 Social Media

- **LinkedIn** is the world's largest professional social media network. The majority of LinkedIn users are over 30, have a higher education degree and a senior-level job position (influencers, decision makers, and C-level executives). The content that performs best on LinkedIn is content that helps being more efficient or industry-specific content. It is ideal for salespeople to connect with prospects and for marketers to run Lead generation campaigns.
  By posing questions, publishing useful content and answering others' questions, the project can foster a cohort of followers and build up an expertise status. LinkedIn Groups are especially useful to this extent.
  LinkedIn SARASH2020 page (see Figure 7): https://www.linkedin.com/company/sarash2020

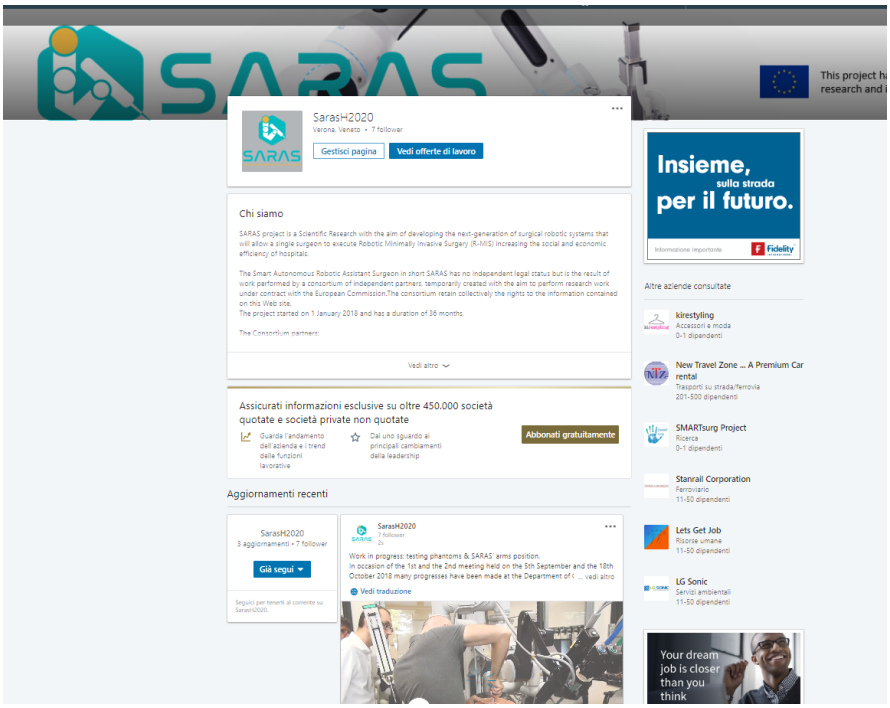


Figure 7 - SARAS' LinkedIn Page

- **Twitter**
  Twitter is also good to gain visibility in the industry sectors related to SARAS. As previously seen for researchers, valuable contents have the potential to direct the audience to the proper page of the website.

1.2.3.3 PR & News

All news, press releases and announcements about the project will sit in the blog area named “News”. In terms of contents and topics this area is quite heterogeneous.

1.2.3.4 Events

We have seen that there are various types of events depending on audiences, objectives, budget and topics. Those ideal for Exploitation are:

- **Exhibitions and trade fairs:** these are business events particularly relevant for industry related topics, where companies showcase new products, technologies or present services.
- **Technology transfer center:** SARAS’ non-academic partners (MEDIN and ACMIT), will exploit their network, with the aim of expanding the number of companies interested in the project’s outcomes.
- **Workshops** involving industrial players to spread the knowledge of SARAS’ cooperative technologies. UNIMORE, UNIFE, OBU and UNIVR have links with local and regional industrial associations, which will allow contacting a number of companies interested in cooperative robotics.
- **Networking & inbound marketing** focuses on relationships with prospective customers and heavily relies on building networks with them. The aim of inbound is to create content such as e-books, newsletters and blogs that triggers the target to interact with the itself. Inbound marketing, however is time-consuming, and requires great attention and know-how on the topic of interest: for those reasons, the CM will publish only contents coming from Partners.

1.3 *Exploitation Plan*

During the first 12 months of the project, thanks also to the contribution of the Industrial Advisory Board (IAB), some key points were identified with the aim of creating an **Innovation Disclosure Process (IDS)**. This is a way to stimulate socio economic development, transforming knowledge into new products and services for the society and creating successful collaborations between researchers and industries.

The IDS should take into account the following steps:

- Establish regular meetings with the R&D team to analyze technology developments and check if there are inventions which fulfill the patent requirements;
- Do a systematic evaluation of patent ideas through a forms in order to evaluate potential impact and business potential.
- Define who can potentially exploit the patent – internal activities such as Spin-Offs or licensing to a potential commercialization partner;
- Organize a workshop on invention disclosure with the project team.

All of this is of fundamental importance for identifying which results, properly developed, are useful for satisfying market needs. In this perspective, by the end of February 2019, a form will be shared with all partners to highlight the results achieved and to describe their KER.

The form could include the following details:

- The KER description
    - Description of the KER
    - Description of the problems the KER is solving
    - Competitor that is/are now solving the same problem
    - Description of how the KER can be transformed into a product/service
    - Description of how your product/service differ from competitors alternative solutions
    - Description of competitive advantage (Unique Selling Point) and strengths
    - Description of any legal, normative or ethical requirements connected to the development of your product
    - Targetted Market and Customer segments (Product positioning)
    - Early adopters
    - Market Trends
    - Market size for the product/service
    - Top three competitors description

A **Strategic Exploitation session** will be scheduled within the Project Meeting of March 2019 - M15, led by the IDM and involving all SARAS Partners will help the Consortium to maximize the effectiveness of the exploitation effort.

In case of valuable results and a clear KER definition the IAB will support the partners in suggesting activities and tools useful for the definition of their individual exploitation plan and the identification of the most appropriate business model.

Individual plans, according to the current partners' core business and expertise, will address the exploitation potential of the specific outcomes produced (and owned) by the individual partners. In the case of the integrated solution which will result from the interaction and integration among the different activities of all SARAS partners a **Global exploitation plan** will be drafted in conjunction. This

joint plan will also take care of identifying target customers, markets, and a possible timeline for the full market outreach.

The results of the exploitation meeting and of all the relevant interactions and analysis, will be the basis for preparing Individual Exploitation Plans - hypothetically by month 24 and a Global Exploitation Plan by month 36.

Table 1 - Exploitation calendar (draft)

	ACTIVITY	DESCRIPTION & AIM	TEAM LEADER	TEAM MEMBER
M10	IAB 1st brain storming	Innovation Disclosure Process has been drafted	IDM	IAB
M14	Form definition	The final Invention Disclosure Form will be shared with all partners to help them draft their KERs	IDM	Team Leaders
M15	Strategic Exploitation session	During the Project meeting the IDM will lead a session to discuss the identified KERs	IDM	All partners
M18 (tentative)	Tools definition	The IAB will evaluate tool offered by the EU community (such as the Common Exploitation Booster) to help partners drafting their individual plans.	IDM	All Partners
M24 (tentative)	Individual plans	External expert will coach partners in preparing the lean canvas of their exploitable results	IDM	All partners
M36 (optional)	Global plan	To be evaluated	IDM	All partners

Appendix A - Communication Report

Here follows a report of the main Communication activities run from the 1st of January till the 4th of December 2018. Note that:

- Tables are extracted from the Social Content Calendar;
- Figures comes from website and social media activities.

1.4 *Social content calendar*

SARAS PROJECT						FACEBOOK			TWITTER			LinkedIn		
SARAS PROJECT	TEXT	URL	#	Im e	SCHE	FB tag	FB published	FB Time	TW tag	TW published	TW Time	TW tag	TW published	TW Time
event	Application deadline to the 2nd Biannual Summer School on Control of Surgical Robots (COSUR 2018):				02-mag			3:34 PM						
mercato	Robotic-assisted surgery is real! The robotic arms made it possible for the team to successfully remove a		#NeurosurgerySurgery #transoralrobotic #TORS		16-mag			12:36 PM						
mercato	New in 2018!! RSS in collaboration with IJRR launch the BEST	https://loom.ly/8Rz0X4M	#RSS2018 #PaperAward #IJRR #RoboticsResearch #Robotics		07-giu			5:27 PM						
event	The SARAS project was officially launched with the Kick off meeting				16-gen			12:00 AM						
collaterals	Tri-fold brochure for external use, to present the project at Conferences and events				14-feb			12:00 AM			7:00 AM			
curation					02-mag					SARAS_H2020 ha ritwittato AltairLab	1:52 PM			
curation					15-mag					A special relationship:	9:42 AM			
curation					07-giu					New in 2018 RSS in collaboration	9:14 AM			
curation					11-giu					TODAY is the last chance to	7:00 AM			
event	Download the program! EndoBarcelona the 8th World Congress	https://buff.ly/2Hq6RMQ	#endoscopic #Surgery #events #Endobarcelona conference		15-giu			10:32 AM			3:00 PM			
event	Strating soon!! 4 days of workshops and conferences with leading medical, science & technology	https://buff.ly/2I7tMUt	#clinicaltopics #events #medicaltechnology #robotics		18-giu			9:32 AM			9:55 AM			
FUN	INWED 2018! International Women in Engineering Day Download and print out your	https://buff.ly/2t2IpvU	#INWED18 selfie cards to promote action via social media.		23-giu			8:54 AM			2:14 PM			
event	STARTING NOW! THE HAMLYN SYMPOSIUM on medical robotics 2018	https://buff.ly/2I8klic	#clinicaltopics #events		24-giu			8:32 AM			8:16 AM			
event	STARTING TODAY! The 2nd Summer School on Control of Surgical	https://buff.ly/2LrtwL5	#surgical #robotics @UniVerona @LabAltair #COSUR2018		09-lug			8:32 AM			8:09 AM			
FUN	Slow down, today is the Simplicity Day! In our fast, ever-increasingly busy lifestyles, National Simplicity	https://buff.ly/2sUstg8	#slowdown #NationalSimplicityDay		12-lug			10:30 AM			10:18 AM			
event	Ing. Elettra Oleari from IRCCS Ospedale San Raffaele has been invited to present SARAS project at the				12-lug			11:10 AM						
curation					13-lug		Congratulations to all the students! ----	5:27 PM		AltairLab	7:59 AM			
curation					19-lug					Horizon 2020 EU	6:30 AM			
curation					31-lug		See you in 2020!! at the Third edition of the Doctoral School on Control of	3:42 PM		26 attendees and 16 speakers from	1:45 PM			
curation	Developing and analyzing procedures in the use of robotics and related technologies for training and				01-ago						2:00 PM			
Impact on hospitals and	Impact on hospitals and healthcare systems. The aim of SARAS is to increase the social and economic	https://saras-project.eu/?page_ic	#efficiency #laparoscopic #robot #health #robotics #surgicalrobots		22-ago			5:09 PM			5:09 PM			
Impact on hospitals and	Impact on hospitals and healthcare systems. The introduction of the SARAS SOLO-SURGERY platform	https://saras-project.eu/?page_ic	#efficiency #laparoscopic #robot #health #robotics #surgicalrobots		28-ago			9:00 AM			9:00 AM			
event	The 5th september SARAS' poster will be presented at the 3rd Euopean Machine Vision Forum Bologna	https://www.emva-forum.org/			31-ago			1:25 PM			11:25 AM			11:25 AM
Impact on hospitals and	Impact on hospitals and healthcare systems: SARAS will increase the number of interventions! Having only	https://saras-project.eu/?page_ic	#efficiency #laparoscopic #robot #health #robotics #surgicalrobots		04-set			12:20 PM			12:20 PM			
Impact on hospitals and	SARAS introduction will certainly mitigate one of the most serious bottlenecks to an efficient Healthcare	https://saras-project.eu/?page_id=101	#prostatectomy #nephrectomy #efficiency #laparoscopic #robot		10-set			11:30 AM			11:30 AM			
curation	Tonight celebrate the European Researchers' Night Friday, 28 September, in over 340 cities across	https://ec.europa.eu/research/mariecurieactions/actions/eu			28-set									
work in progress	Work in progress: testing #phantoms! The materials used to realise phantoms must have the same	https://saras-project.eu/?	#research		08-nov			10:34 AM			10:34 AM			
Video	Watch the video of the test of Prostate's phantom and the positioning of the SARAS arms with respect to the	https://youtu.be/-ugV7XXI	#robotics #surgery #RMIS #Phantoms #research		13-nov			11:49 AM			11:49 AM			
work in progress	Work in progress: testing SARAS arms positioning! During the test we chose to change the approach of	https://saras-project.eu/?p=699#more-699			15-nov									
event	Our Partner @UNIVR presented the paper "Recognition self-awareness for active object	https://youtu.be/VuYArzGHCJE			03-set			11:50 AM			11:40 AM			
event	Riccardo Muradore from the Department of Computer Science of the University of Verona (Italy) presented at				22-ott	https://www.facebook.com/IECON-2018-Annual-Conference-of-the-			@IECON_2018					
event	Our Partner OBU will present the the paper "Incrementa	https://saras-project.eu/?tribe_events=the-14th-asian-confer			28-nov									
	vedi pubblicazioni / video ecc													
Impact on hospitals and	patient safety will be positively affected, since the SARAS system can reduce involuntary lesions due to													

1.5 *Web and social media pages*

1.5.1 Official Website

http://saras-project.eu/ (see Figure 8)

The website structure and navigation menu:

- Home Page (HP)
  - Menu area
  - Banner Hero
  - Saras at a Glance
  - Highlights section
  - News section
  - Testimonials
  - SARAS Consortium slider
  - Meet the Team section
- Project
  - Objectives
  - Concept & Approach
  - Ambition
  - Impact
  - Horizon 2020
- Consortium
  - Impressum
  - Work plan
  - Management Structure
  - Meet the Team
- Publications
- News
  - Press review
  - Events
  - Downloads
- Contact

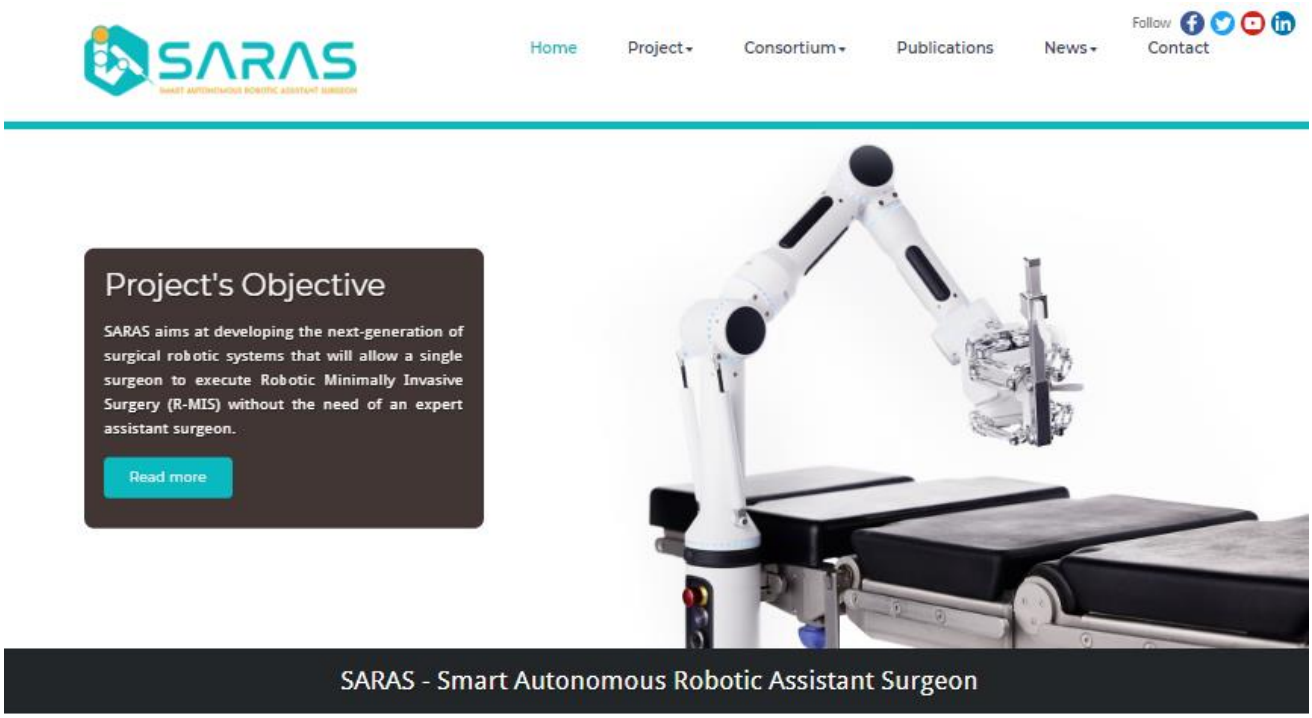


Figure 8 - Website Home Page

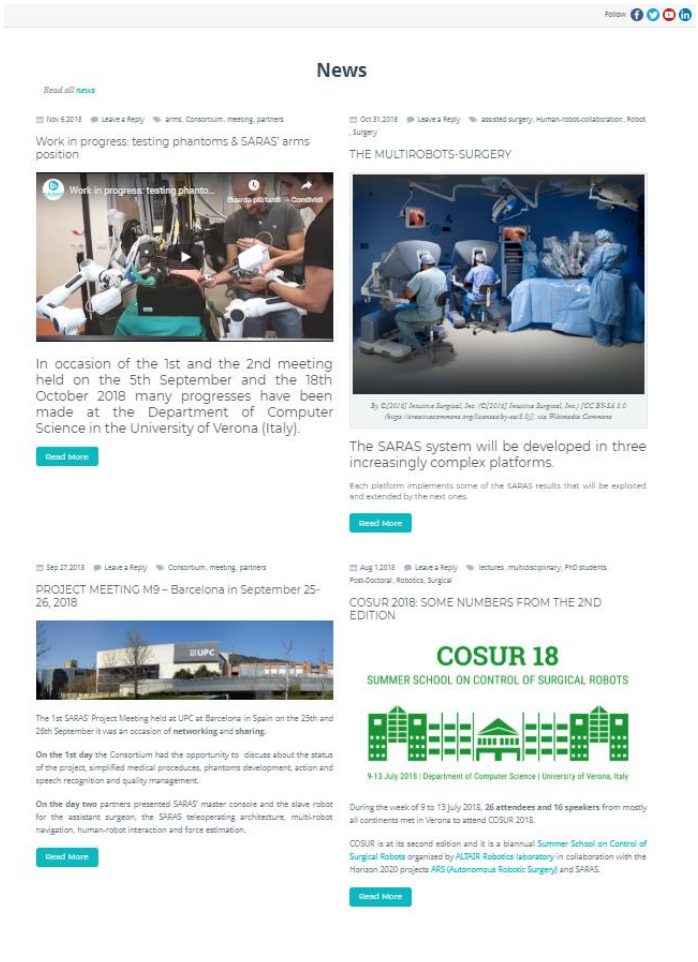


Figure 9 - News Section in the Home Page

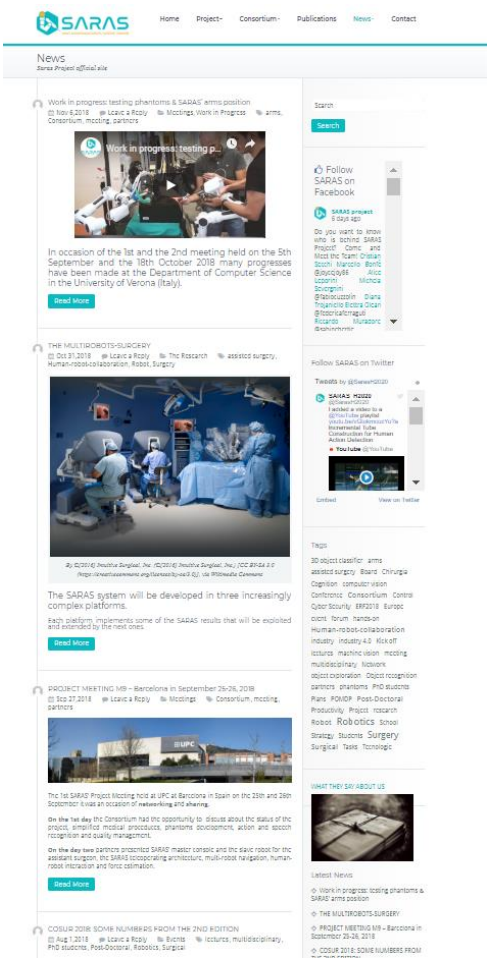


Figure 10 - News area

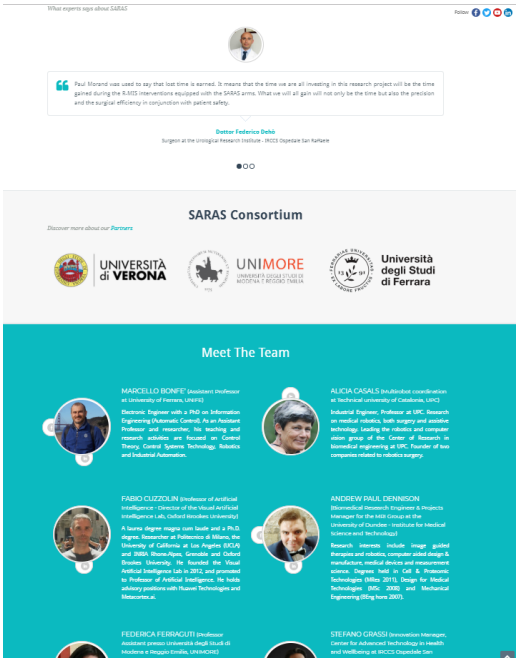


Figure 11 - Consortium slider and Meet the Team section in the Home Page

Figure 12 - Consortium Page

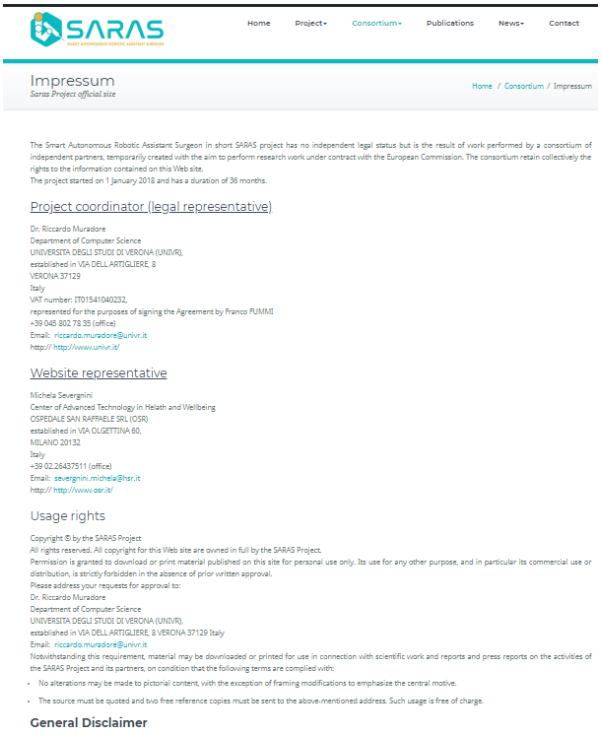


Figure 13 - Impressum Page

Figure 14 - Work Plan - Consortium area

Figure 15 - Management structure - Consortium area

Figure 16 - Meet the Team Page

1.5.2 Facebook Page

https://www.facebook.com/SarasH2020/

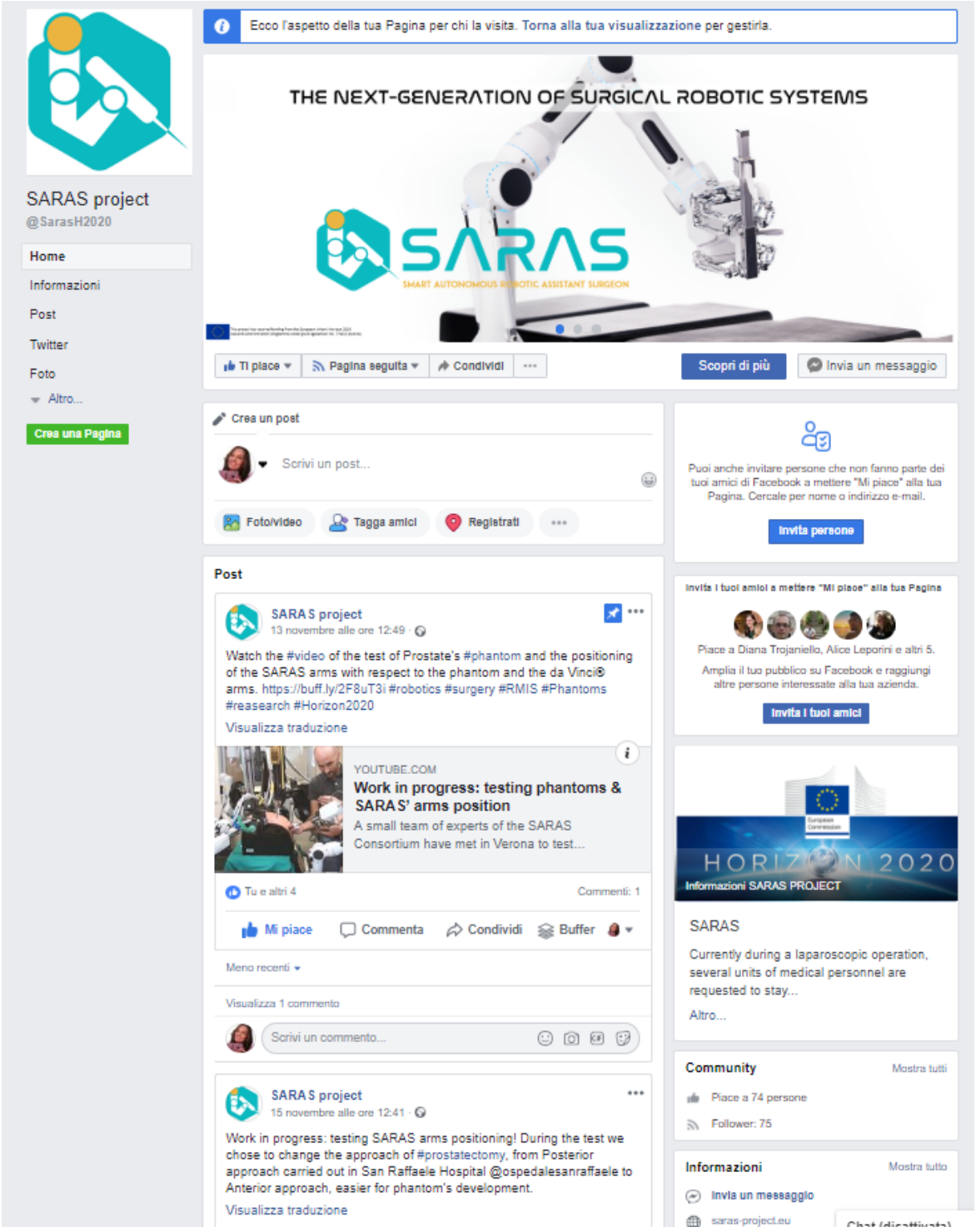


Figure 17 - Facebook Page

1.5.3 Twitter Profile

https://twitter.com/SarasH2020

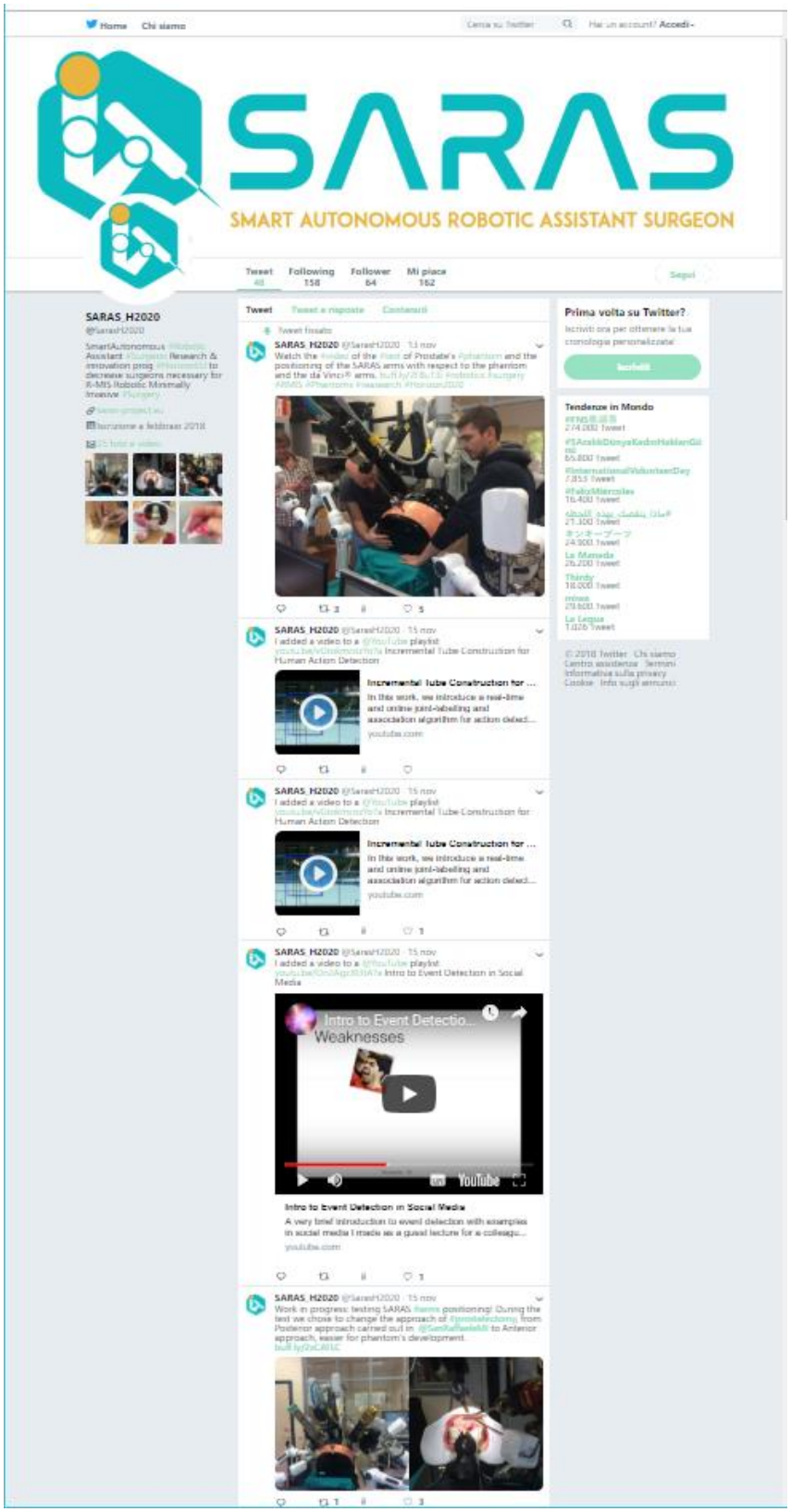


Figure 18 - Twitter page

1.5.4 LinkedIn Page

https://www.linkedin.com/company/sarash2020/

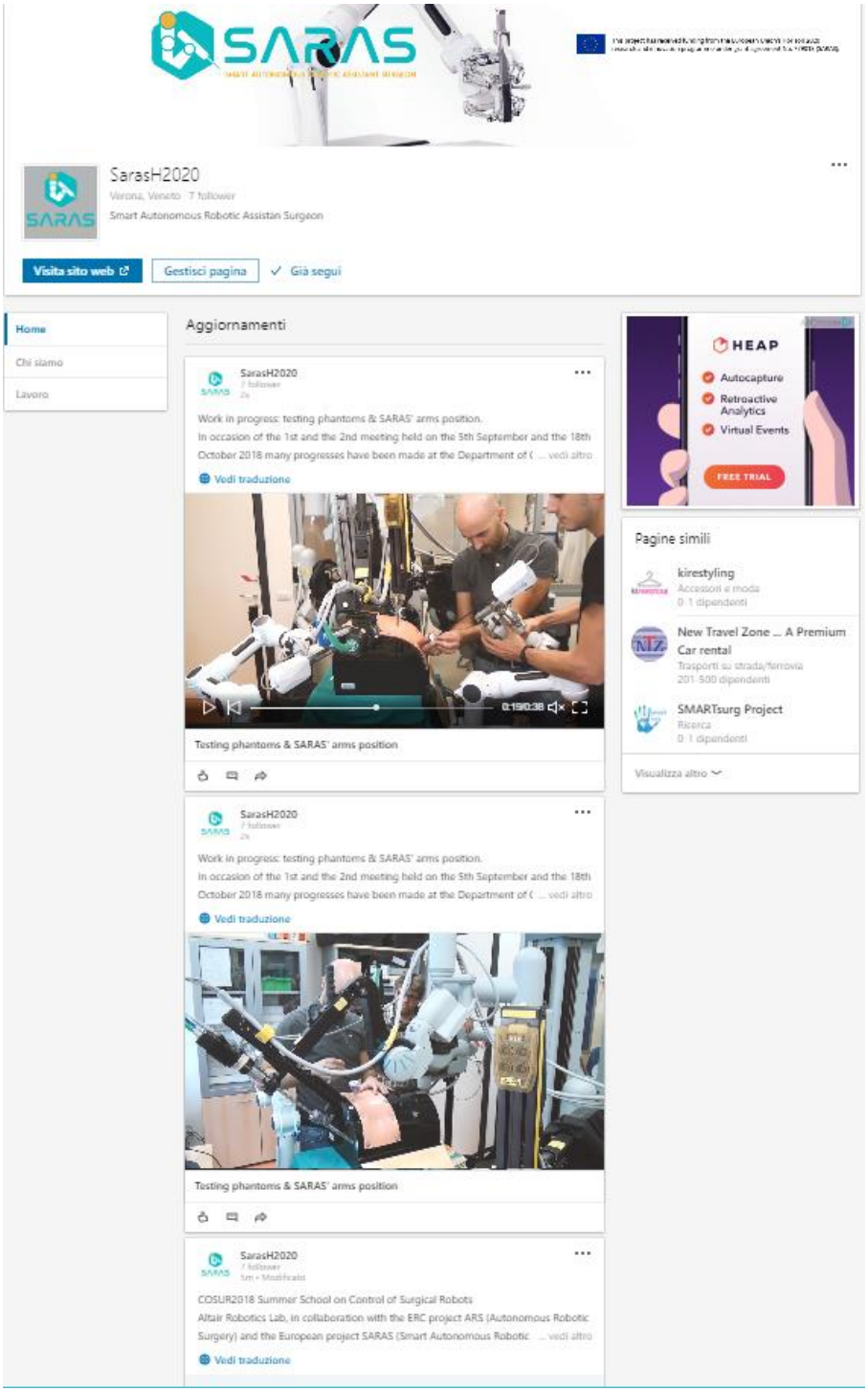


Figure 19 - LinkedIn Page

1.5.5 YouTube Channel

https://www.youtube.com/channel/UCh3x52tiWIs8dsUTbiYNuDw

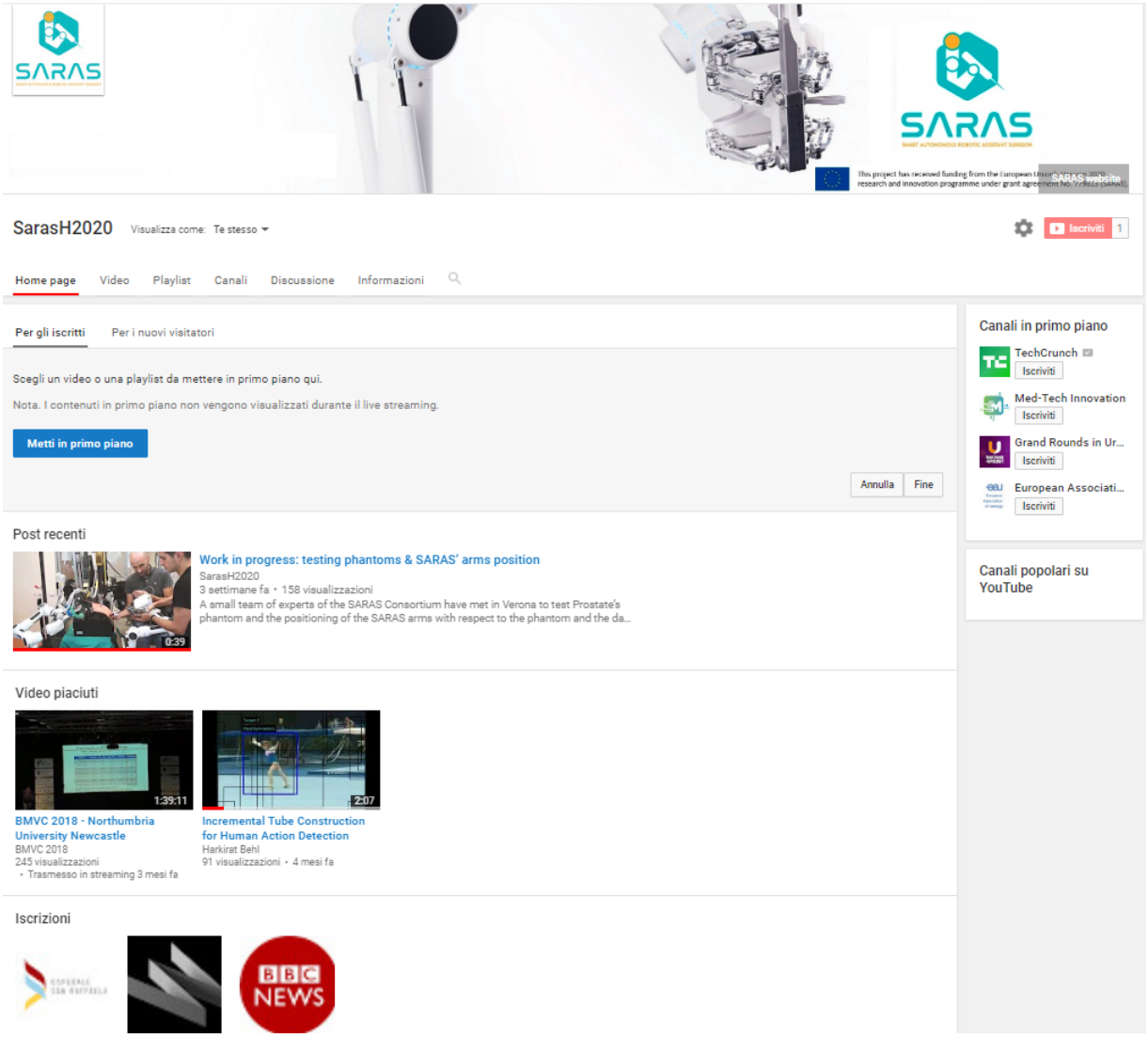


Figure 20 - YouTube Channel

Appendix B - Dissemination Report

An effective dissemination is essential in order to ensure that research results are adapted for the specific target groups.

Here follows a report of all dissemination activities run from the 1st of January till the 4th of December 2018:

- Tables are extracted from the Dissemination Calendar
- Figures comes from website and social media activities

1.6 *Dissemination calendar*

1.6.1 PUBLICATIONS-JOURNALS-PAPERS

SARAS JOURNALS/PUBLICATIONS

Date publishing	TITLE	Authors	Partner	Editors	Type of publication *BOOK= Book/Chapter* *PAPER= Proceeding/Inproceeding/ConferencePaper* *JOURNAL= Journal/Article* *THESIS= Master Thesis*	Abstract	Keywords	OPEN ACCESS Y/N	DOI	PDF	ISBN	ISSN	URL	status of publication	Conference Name / Book title/ Journal Name / School name
06/09/18	Recognition self-awareness for active object recognition on depth images.	Andrea Roberti, Marco Carletti, Francesco Setti, Umberto Castellani, Paolo Fiorini, and Marco Cristani	UNIVR	British Machine Vision Conference (BMVC). Newcastle-Upon-Tyne, UK. (bmvc2018.org).	PAPER= Proceeding/Inproceeding/ConferencePaper	We propose an active	Object recognition, ob	YES	NA	yes			http://bmvc2018.org/contents/papers/0593.pdf	social + web	BMVC 2018
06/09/18	Incremental Tube Construction for Human Action Detection	Harkirat S. Behl, Michael Sapienza, Gurkirt Singh, Suman Saha, Fabio Cuzzolin and Philip H. S. Torr	OBU	Proceedings of BMVC 2018 (the British Machine Vision Conference), Newcastle, UK, Sep 2018	PAPER= Proceeding/Inproceeding/ConferencePaper	Current state-of-the-a	Computer Vision; Pattern Recognition	?	?	yes			https://arxiv.org/abs/1704.01358	WEB	BMVC 2018
21/10/18	An energy saving approach to active object recognition and localization.	Andrea Roberti, Riccardo Muradore, Paolo Fiorini, Marco Cristani, Francesco Setti	UNIVR	Annual Conference of the IEEE Industrial Electronics Society (IECON).Washington, DC, USA	PAPER= Proceeding/Inproceeding/ConferencePaper	We propose an active	Active object recognition, reinforcement learning,	?	?	yes			NOT ONLINE - should I place it on ZENODO?	WEB	IECON 2018
01/08/18	TraMNet - Transition Matrix Network for Efficient Action Tube Proposals	Gurkirt Singh, Suman Saha, and F. Cuzzolin	OBU	Proceedings of ACCV 2018 (the Asian Computer Vision Conference), Perth, Australia, Dec 2018	PAPER= Proceeding/Inproceeding/ConferencePaper	Current state-of-the-a	Image and Video Processing, Computer vision, Pattern Recognition, Robotics	?	?	yes			https://arxiv.org/abs/1808.00297	WEB	ACCV 2018
23/08/18	Predicting action tubes	Gurkirt Singh, Suman Saha and F. Cuzzolin	OBU	Proceedings of the ECCV 2018 Workshop on Anticipating Human Behaviour (AHB 2018), Munich, Germany, Sep 2018	PAPER= Proceeding/Inproceeding/ConferencePaper	In this work, we prese	Computer Vision and Pattern Recognition; Artificial Intelligence; Robotics	?	?	?			https://arxiv.org/abs/1808.07712	WEB	ECCV 2018

Figure 21 - DISSEMINATION CALENDAR: Sheet 1

In teal closed and done activities.

1.6.2 CONFERENCES

	SARAS CONFERENCES & INVITED LECTURE									
Date	Title (Conference)	Title (Publication)	Theme	PARTNER ATTENDING	Details	Venue	Year	Audience	URL	NOTES
03/09/18	BMVC 2018	Paper "Recognition self-awareness for active object recognition on depth images" + Paper ""Incremental Tube Construction for Human Action Detection""	Computer vision	UNIVR + OBU	29TH BRITISH MACHINE VISION CONFERENCE	Newcastle, UK	2018	Researchers (T3)	http://bmvc2018.org/index.html	web
07/09/18	EMVA European Machine Vision Forum	SARAS' Poster	Computer vision	UNIVR	The flagship annual conference of the IEEE Industrial Electronics Society (IES), focusing on industrial and manufacturing theory and applications of controls, communications, instrumentation, electronics, and computational intelligence.	Italy - Bologna	2018	Researchers (T3)	https://www.emva-forum.org/	web
22/10/18	IECON2018	paper "An energy saving approach to active object recognition and localization"		UNIVR	The flagship annual conference of the IEEE Industrial Electronics Society (IES), focusing on industrial and manufacturing theory and applications of controls, communications, instrumentation, electronics, and computational intelligence.	Washington DC, USA	2018	Researchers (T3)	http://iecon2018.org/	web
02/12/18	ACCV 2018	TraMNet - Transition Matrix Network for Efficient Action Tube Proposals	Computer vision	OBU	The Conference will be held in the Perth Conv	Perth, Australia	2018	Researchers (T3)	http://accv2018.net/	web
08/09/18	ECCV 2018	OBU presenting paper "Predicting action tubes"	Computer vision	OBU	The European Conference on Computer Vision 2018 in Munich, Germany. This constitutes by far the largest ECCV ever. With near 3200 registered participants and another 650 on the waiting list as we write, participation has more than doubled since the last ECCV in Amsterdam.	Munich, Germany	2018	Researchers (T3)	https://eccv2018.org/	web

Figure 22 - DISSEMINATION CALENDAR: Sheet 2

In teal closed activities, in red the planned ones.

1.6.3 EVENTS

	SARAS EVENTS									
#Month	Title	Category	Theme	Details	Venue	Date	Year	Audience	Website (if available)	Partners
M2	SIC 2018 - Primo Convegno delle Società Chirurgiche della Campania, Puglia, Basilicata, Calabria Sicilia.	Congress/Conference	Robotics		Naples, Italy	12.02.		Healthcare Experts (T2)		OSR
M3	ERF2018 -The European Robotics Forum	Exhibition	Robotics		Tampere, Finland	13.-15.03.		European companies (T4)	https://www.eu-robotics.net/robotics_forum/info/index.html	UNIVR
M5	AEDV 2018 46th National Conference on Dermatology and Venereology	Congress/Conference	Other	Surgical Training	Mallorca, Spain	9.-12.05.	2018	Healthcare Experts (T2)	https://web.congresoaedv.net/	UPC
M17	ICRA2019 - IEEE International Conference on Robotics and Automation	Congress/Conference	Robotics		Montreal, Canada	20.-24.05.	2019	Researchers (T3)	https://icra2019.org/	UPC, UNIMORE

Figure 23 - DISSEMINATION CALENDAR: Sheet 3

In teal closed activities, in red the tentative planned ones.

1.6.4 WORKSHOPS

	SARAS WORKSHOPS								
#Month	Title	Details	Venue	Date	Year	Audience	Formula	Website (if available)	Partners
M6	2 MelaTx Workshop	Surgical training	Sevilla, Spain		2018	Healthcare Experts (T2)	SARAS Workshop for clinical staff		UPC
M10	IROS Conference	Conference paper: Estimation of Interaction Forces in Robotic Surgery using a Semi-Supervised Deep Neural Network Model	Madrid Municipal Conference Centre	2 October		Researchers (T3)	Session Medical Robotics	https://www.iros201	UPC
M18	SARAS Workshop for clinical staff				2019	Healthcare Experts (T2)	SARAS Workshop for clinical staff		
M22	HFR2019 12th International Workshop on Huma-friendly robotics		Reggio Emilia	24-25 October	2019	Researchers (T3)		tbd	unimore/unife
M22	SARAS Workshop Y2 - results - achievements - targets	The workshops will summarise the results of the project, present the achievements obtained (including demonstrations), and outline the desired targets for the next period. Participants and speakers will be researchers representing SARAS' two major fields of application (robotics and surgery), and will not be restricted to project partners but will also crucially include outside experts and representatives of the disciplined involved. These workshops will also highlight the impact of SARAS' abilities (cognition and perception, interaction, autonomy and safety) in other research fields. - This workshop raises awareness of the project's results (MS7).			2019	Researchers (T3)	SARAS Workshop Y2 - results - achievements - targets		
M30	SARAS Workshop with Industrial Players				2020	European companies (T4)	SARAS Workshop with Industrial Players		
M34	SARAS Workshop Y3 - results - achievements - targets	The workshops will summarise the results of the project, present the achievements obtained (including demonstrations), and outline the desired targets for the next period. Participants and speakers will beresearchers representing SARAS' two major fields of application (robotics and surgery), and will not be restricted to project partners but will also crucially include outside experts and representatives of the disciplined involved. These workshops will also highlight the impact of SARAS' abilities (cognition and perception, interaction, autonomy and safety) in other research fields.			2020	Researchers (T3)	SARAS Workshop Y3 - results - achievements - targets		
M36	SARAS Final demonstration of the SARAS system in OSR	A final demonstration and exhibition event at OSR, to raise interest in the future exploitation of SARAS system.			2020	Healthcare Experts (T2)	SARAS Final demonstration of the SARAS system in OSR		

Figure 24 - DISSEMINATION CALENDAR: Sheet 4

In teal closed activities, in red the tentative planned ones.

1.6.5 MEETINGS

#Month (tentative)	Venue	Date (tentative)	Type of meeting	Date	month	year	Status
M1	OSR	January 16-17, 2018	Kick-off meeting	16-17th	January	2018	Closed
M9	UPC	September 2018	Project meeting & Remote Review Meeting	25-26TH	September	2018	Closed
M12	UNIVR	early December 2018	Integration week for MULTI-ROBOT SURGERY platform (+ video)		December	2018	
M15	MEDIN	March 2019	Project meeting	12-13th	March	2019	
M18+2	UNIVR	September 2019	Mid-term review meeting		September	2019	
M24	UNIVR	early December 2019	Integration week for SOLO SURGERY platform (+ video)		December	2019	
M27	TBD @ ERF20	March 2020	Project meeting		March	2020	
M36	UNIVDUN	early December 2020	Integration week for LAPARO SURGERY platform (+ video)		December	2020	
M36+2	UNIVDUN	February 2021	Final Review meeting (with video of SOLO SURGERY platform)		february	2021	

Figure 25 - DISSEMINATION CALENDAR: Sheet 5

In teal closed activities, in black the planned ones.

1.7 *Dissemination activities*

1.7.1 PUBLICATIONS-JOURNALS-PAPERS

On the website there is a dedicated section "Publications[11]" where Researchers can find all publications and access the PDF file or the publisher landing page to purchase it.

Figure 26 - Publication Page in the Website

[11] https://saras-project.eu/?page_id=894

A. ROBERTI ET AL.: RECOGNITION SELF-AWARENESS 1

Recognition self-awareness for active object recognition on depth images

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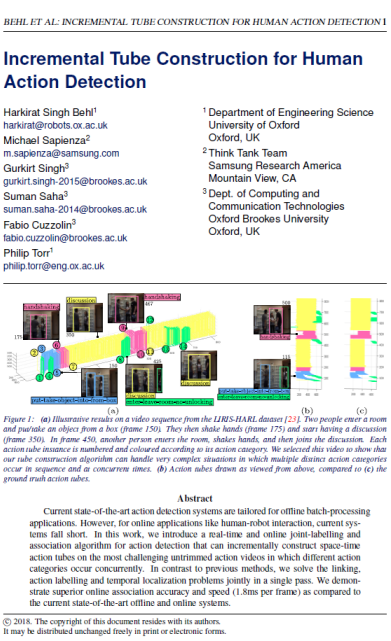
Abstract

We propose an active object recognition framework that introduces the *recognition self-awareness*, which is an intermediate level of reasoning to decide which views to cover during the object exploration. This is built first by learning a multi-view deep 3D object classifier; subsequently, a 3D dense saliency volume is generated by fusing together single-view visualization maps, these latter obtained by computing the gradient map of the class label on different image planes. The saliency volume indicates which object parts the classifier considers more important for deciding a class. Finally, the volume is injected in the observation model of a Partially Observable Markov Decision Process (POMDP). In practice, the robot decides which views to cover, depending on the expected ability of the classifier to discriminate an object class by observing a specific part. For example, the robot will look for the engine to discriminate between a bicycle and a motorbike, since the classifier has found that part as highly discriminative. Experiments are carried out on depth images with both simulated and real data, showing that our framework predicts the object class with higher accuracy and lower energy consumption than a set of alternatives.

1 Introduction

Active object recognition (AOR) allows to consider different views of the test object, overcoming the single-view hypothesis of classical object recognition, making the classification problem much easier in principle. Unfortunately, this freedom comes with a price, which is that of maneuvering the sensor for selecting informative images: in fact, not all the views are equally discriminative [21], too similar images are not informative and the movements of



BEHL ET AL.: INCREMENTAL TUBE CONSTRUCTION FOR HUMAN ACTION DETECTION 1

Incremental Tube Construction for Human Action Detection

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Gurkirt Singh[3]
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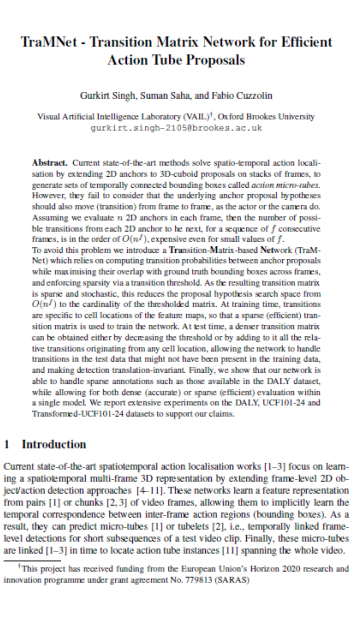
Figure 1: (a) Illustrative results on a video sequence from the LIRIS-HARL dataset [23]. Two people enter a room and partake an object from a box (frame 150). They then shake hands (frame 175) and start having a discussion (frame 350). In frame 450, another person enters the room, shakes hands, and then joins the discussion. Each action tube instance is numbered and coloured according to its action category. We selected this video to show that our tube consruction algorithm can handle very complex situations in which multiple distinct action categories occur in sequence and a concurrent times. (b) Action tubes drawn as viewed from above, compared to (c) the ground truth action tubes.

Abstract

Current state-of-the-art action detection systems are tailored for offline batch-processing applications. However, for online applications like human-robot interaction, current systems fall short. In this work, we introduce a real-time and online joint-labelling and association algorithm for action detection that can incrementally construct space-time action tubes on the most challenging untrimmed action videos in which different action categories occur concurrently. In contrast to previous methods, we solve the linking, action labelling and temporal localization problems jointly in a single pass. We demonstrate superior online association accuracy and speed (1.8ms per frame) as compared to the current state-of-the-art offline and online systems.



TraMNet - Transition Matrix Network for Efficient Action Tube Proposals

Gurkirt Singh, Suman Saha, and Fabio Cuzzolin

Visual Artificial Intelligence Laboratory (VAIL)[1], Oxford Brookes University
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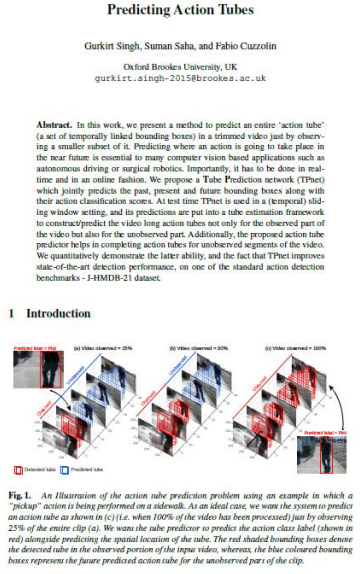
Abstract. Current state-of-the-art methods solve spatio-temporal action localisation by extending 2D anchors to 3D-cuboid proposals on stacks of frames, to generate sets of temporally connected bounding boxes called *action micro-tubes*. However, they fail to consider that the underlying anchor proposal hypotheses should also move (transition) from frame to frame, as the actor or the camera do. Assuming we evaluate n 2D anchors in each frame, then the number of possible transitions from each 2D anchor to he next, for a sequence of f consecutive frames, is in the order of $O(n^f)$, expensive even for small values of f.
To avoid this problem we introduce a **Tra**nsition-**M**atrix-based **Net**work (TraMNet) which relies on computing transition probabilities between anchor proposals while maximising their overlap with ground truth bounding boxes across frames, and enforcing sparsity via a transition threshold. As the resulting transition matrix is sparse and stochastic, this reduces the proposal hypothesis search space from $O(n^f)$ to the cardinality of the thresholded matrix. At training time, transitions are specific to cell locations of the feature maps, so that a sparse (efficient) transition matrix is used to train the network. At test time, a denser transition matrix can be obtained either by decreasing the threshold or by adding to it all the relative transitions originating from any cell location, allowing the network to handle transitions in the test data that might not have been present in the training data, and making detection translation-invariant. Finally, we show that our network is able to handle sparse annotations such as those available in the DALY dataset, while allowing for both dense (accurate) or sparse (efficient) evaluation within a single model. We report extensive experiments on the DALY, UCF101-24 and Transformed-UCF101-24 datasets to support our claims.

1 Introduction

Current state-of-the-art spatiotemporal action localisation works [1–3] focus on learning a spatiotemporal multi-frame 3D representation by extending frame-level 2D object/action detection approaches [4–11]. These networks learn a feature representation from pairs [1] or chunks [2, 3] of video frames, allowing them to implicitly learn the temporal correspondence between inter-frame action regions (bounding boxes). As a result, they can predict micro-tubes [1] or tubelets [2], i.e., temporally linked frame-level detections for short subsequences of a test video clip. Finally, these micro-tubes are linked [1–3] in time to locate action tube instances [11] spanning the whole video.

[1]This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 779813 (SARAS)



Predicting Action Tubes

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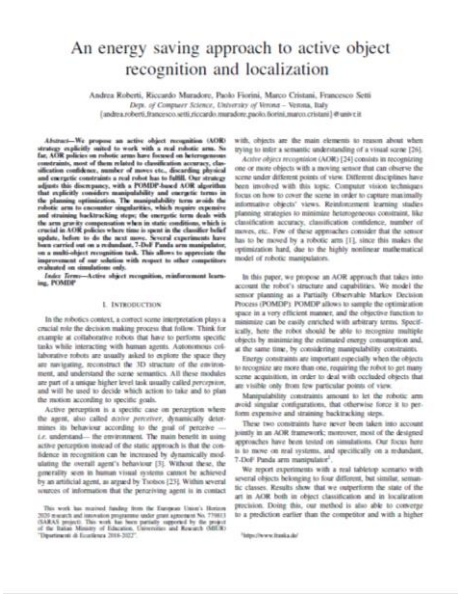
Abstract. In this work, we present a method to predict an entire 'action tube' (a set of temporally linked bounding boxes) in a trimmed video just by observing a smaller subset of it. Predicting where an action is going to take place in the near future is essential to many computer vision based applications such as autonomous driving or surgical robotics. Importantly, it has to be done in real-time and in an online fashion. We propose a Tube Prediction network (TPnet) which jointly predicts the past, present and future bounding boxes along with their action classification scores. At test time TPnet is used in a (temporal) sliding window setting, and its predictions are put into a tube estimation framework to construct/predict the video long action tubes not only for the observed part of the video but also for the unobserved part. Additionally, the proposed action tube predictor helps in completing action tubes for unobserved segments of the video. We quantitatively demonstrate the latter ability, and the fact that TPnet improves state-of-the-art detection performance, on one of the standard action detection benchmarks - J-HMDB-21 dataset.

1 Introduction

Fig. 1. An illustration of the action tube prediction problem using an example in which a "pickup" action is being performed on a sidewalk. As an ideal case, we want the system to predict an action tube as shown in (c) (i.e. when 100% of the video has been processed) just by observing 25% of the entire clip (a). We want the tube predictor to predict the action class label (shown in red) alongside predicting the spatial location of the tube. The red shaded bounding boxes denote the detected tube in the observed portion of the input video, whereas, the blue coloured bounding boxes represent the future predicted action tube for the unobserved part of the clip.



An energy saving approach to active object recognition and localization

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Abstract—We propose an active object recognition (AOR) strategy explicitly suited to work with a real robotic arm. So far, AOR policies on robotic arms have focused on heterogeneous constraints, most of them related to classification accuracy, classification confidence, number of moves etc., discarding physical and energetic constraints a real robot has to fulfill. Our strategy adjusts this discrepancy, with a POMDP-based AOR algorithm that explicitly considers manipulability and energetic terms in the planning optimization. The manipulability term avoids the robotic arm to encounter singularities, which require expensive and straining backtracking steps; the energetic term deals with the arm gravity compensation when in static conditions, which is crucial in AOR policies where time is spent in the classifier belief update, before to do the next move. Several experiments have been carried out on a redundant, 7-DoF Panda arm manipulator, on a multi-object recognition task. This allows to appreciate the improvement of our solution with respect to other competitors evaluated on simulations only.

Index Terms—Active object recognition, reinforcement learning, POMDP

This work has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 779813 (SARAS project). This work has been partially supported by the project of the Italian Ministry of Education, Universities and Research (MIUR) "Dipartimenti di Eccellenza 2018-2022".

Figure 27 - Publications preview

1.7.2 CONFERENCES

BMVC 2018 - The British Machine Vision Conference (BMVC) is the British Machine Vision Association (BMVA) annual conference on machine vision, image processing, and pattern recognition.

SARAS Partners presented two papers: the videos of both presentations are available on the website in the event page, in the YouTube Channel and have been posted on Twitter.

Figure 28 - The BMVC 2018 Event Page

Our Partner UNIVR presented the Paper “Recognition self-awareness for active object recognition on depth images”.

Figure 29 - The video of UNIVR presentation

Our Partner OBU presented the paper “Incremental Tube Construction for Human Action Detection”.

Figure 30 - The Video of OBU presentation

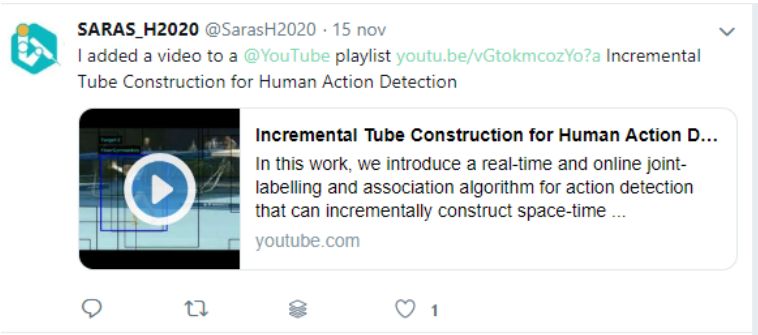


Figure 31 - Twitter post of the OBU Paper

EMVA 2018 - Third European Machine Vision Forum (EMVA), an annual event with the aim to foster interaction between the machine vision industry and academic research to learn from each other.

Figure 32 - EMVA event page

Figure 33 - EMVA 2018 Tweet

IECON2018 – this is the flagship annual conference of the IEEE Industrial Electronics Society (IES), focusing on industrial and manufacturing theory and applications of controls, communications, instrumentation, electronics, and computational intelligence.

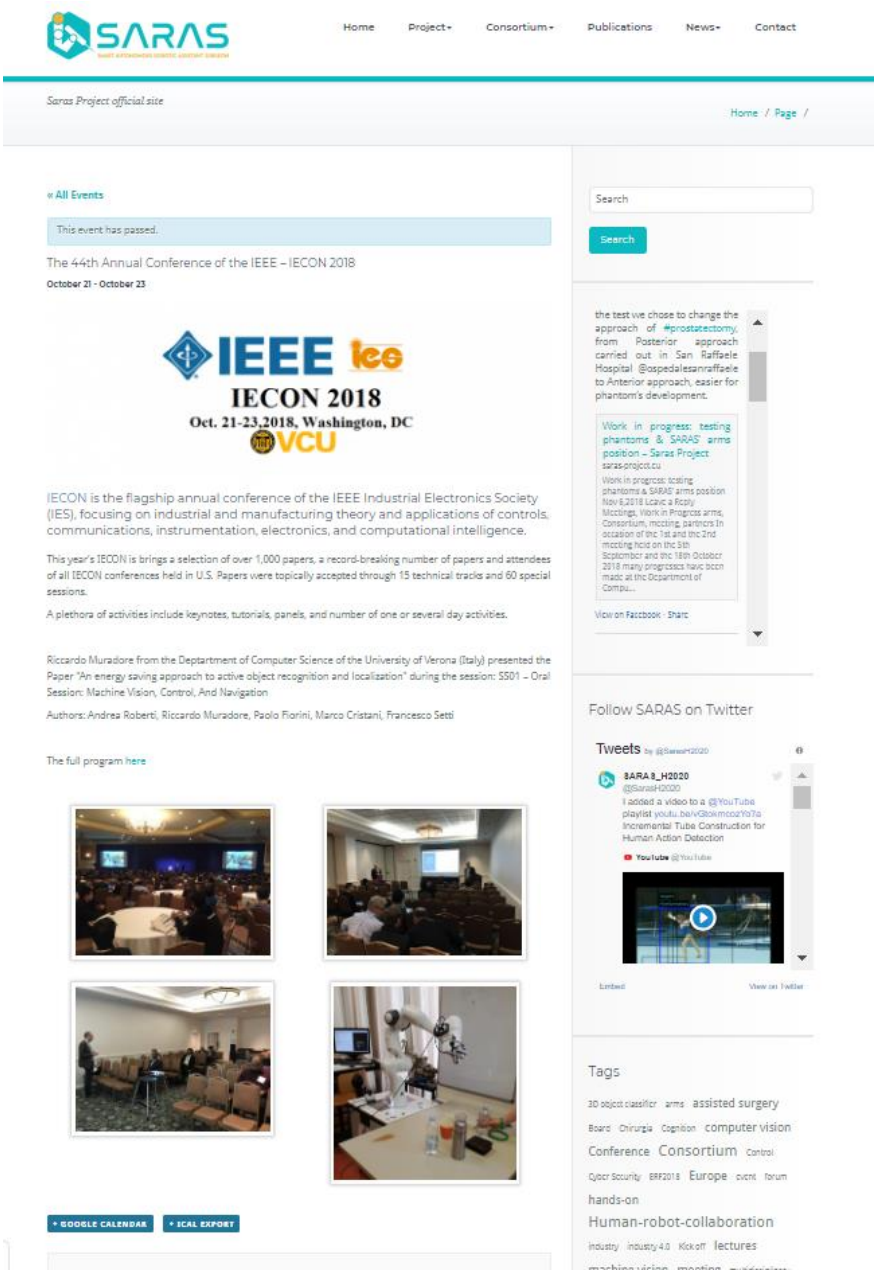


Figure 34 - IECON 2018 Event Page

ECCV 2018 - The European Conference on Computer Vision 2018 in Munich, Germany.

Our partners from the Oxford Brookes University – OBU presented on the Session the Paper ” Predicting Action Tubes” between 14:00 and 15:00 Saturday 8th afternoon, Room: N1080ZG.

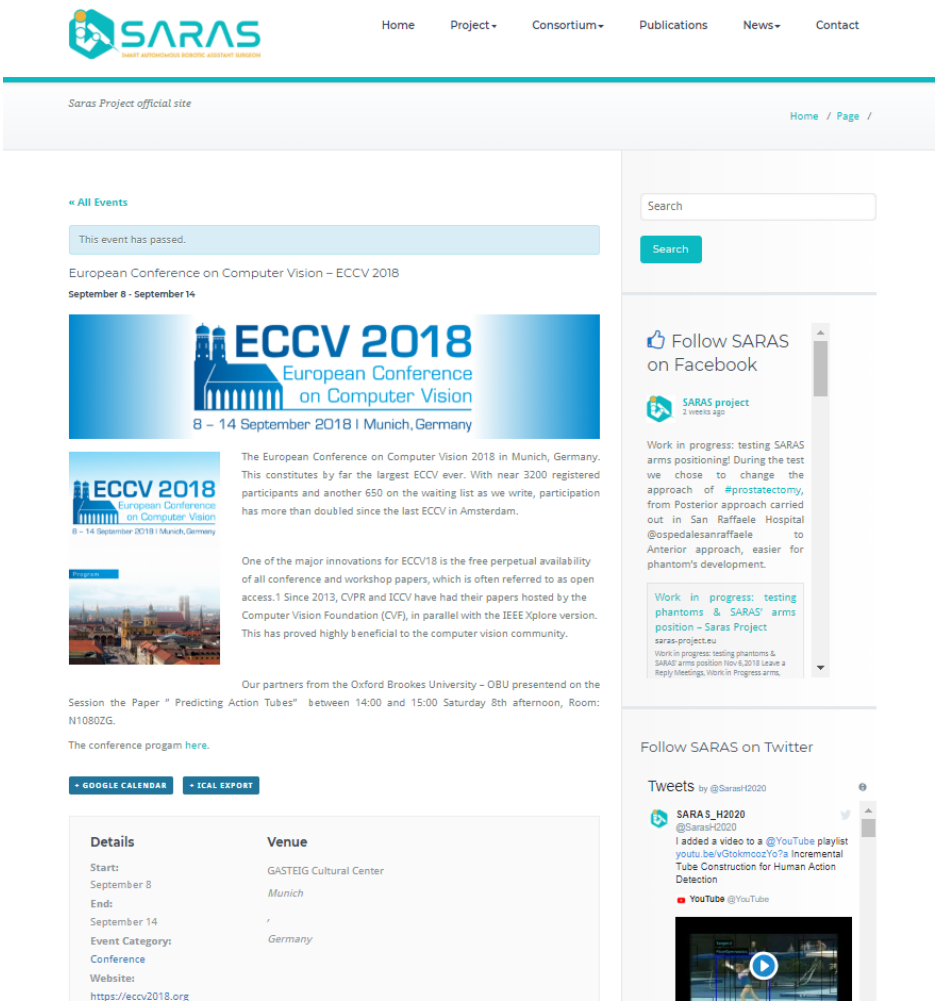


Figure 35 - ECCV 2018 Event Page

1.7.3 EVENTS

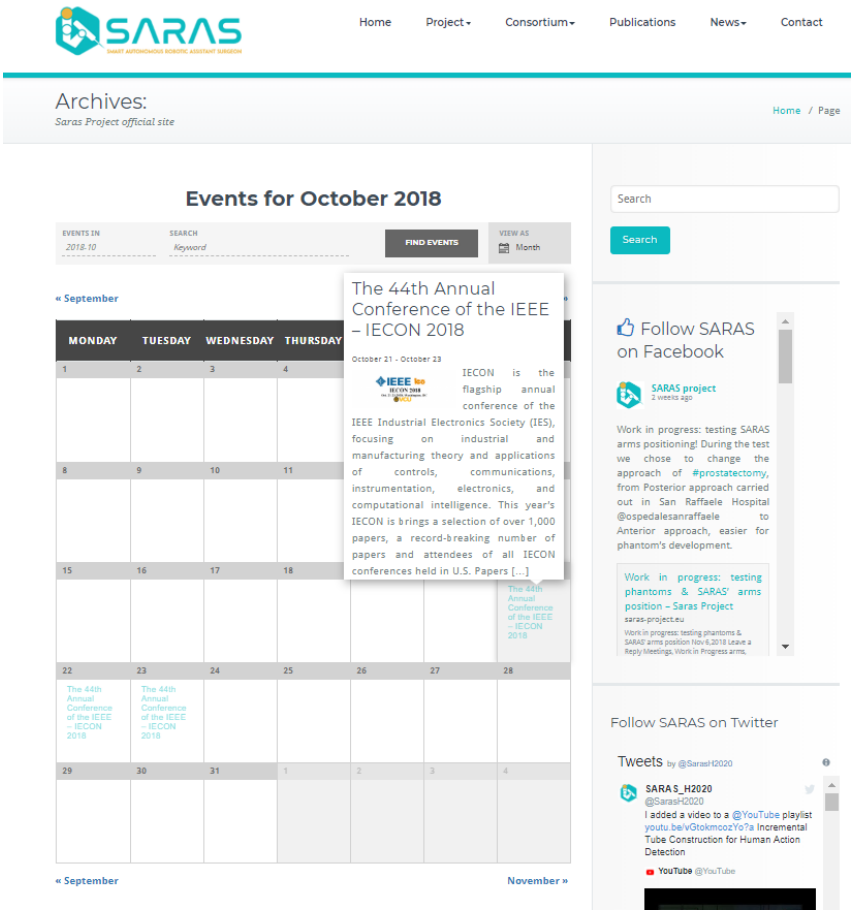


Figure 36 - Calendar View of the Event page in the website

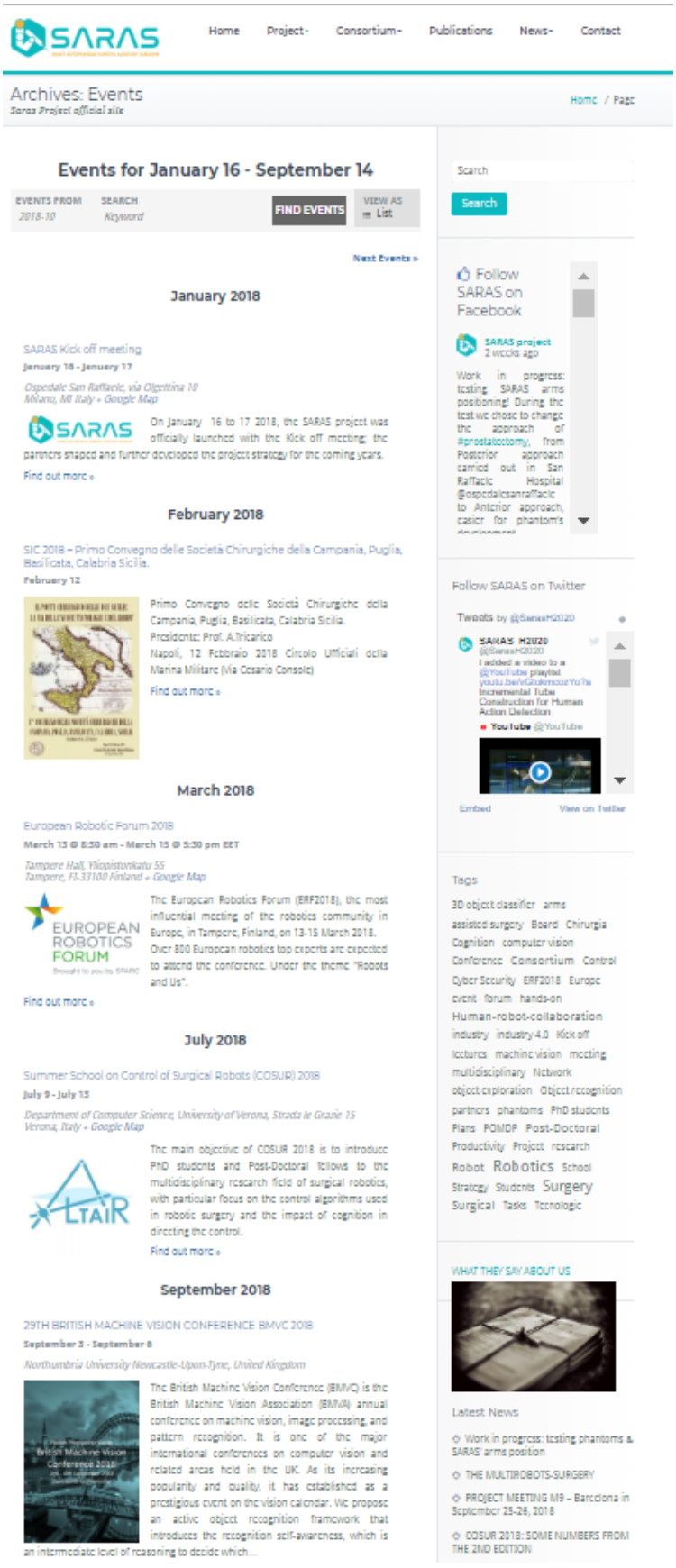


Figure 37 - The list view of the Event Page on the website

SIC 2018: 1st Congress of Surgical societies of Campania, Puglia, Basilicata, Calabria, Sicilia.
A Congress held in Naples – Italy the 12th February 2018 for Healthcare Experts and organized by the Circolo Ufficiali della Martina Militare.

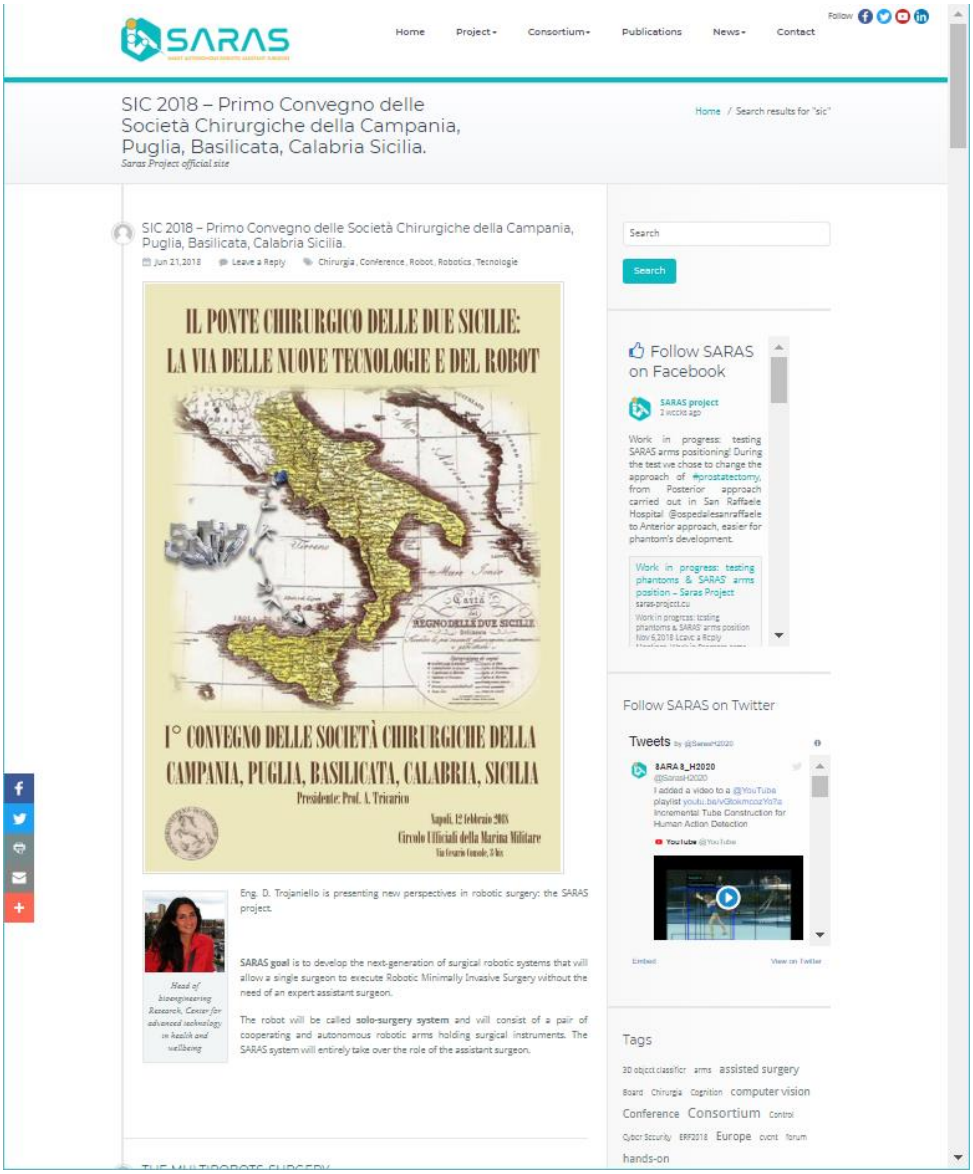
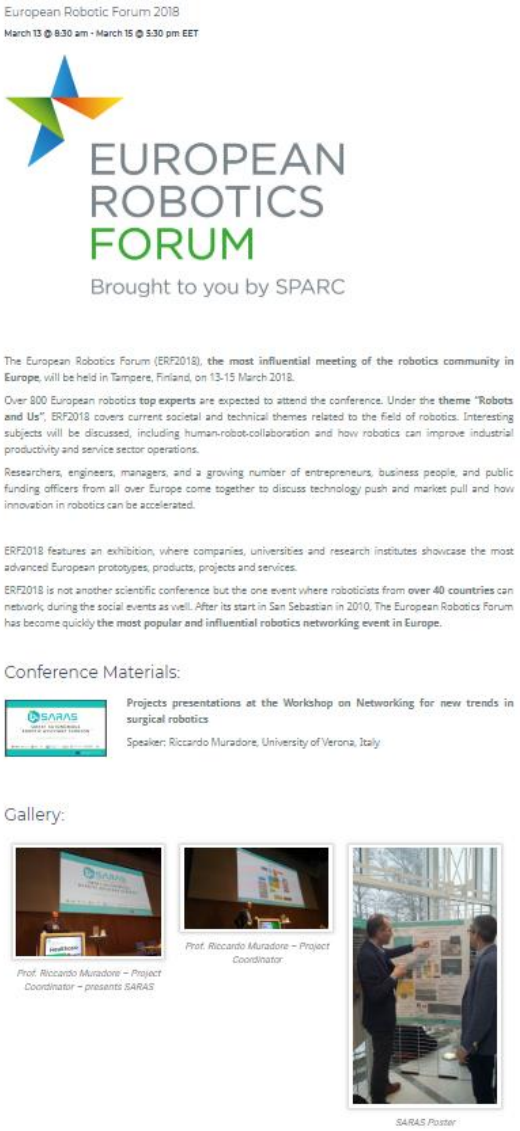


Figure 38 - SIC 2018 Event page

ERF 2018: The European Robotics Forum (ERF2018), the most influential meeting of the robotics community in Europe, in Tampere, Finland, on 13-15 March 2018, organized for European robotics top experts are expected to attend the conference.


European Robotic Forum 2018

March 13 @ 8:30 am - March 15 @ 5:30 pm EET

EUROPEAN ROBOTICS FORUM

Brought to you by SPARC

The European Robotics Forum (ERF2018), **the most influential meeting of the robotics community in Europe**, will be held in Tampere, Finland, on 13-15 March 2018.

Over 800 European robotics **top experts** are expected to attend the conference. Under the **theme "Robots and Us"**, ERF2018 covers current societal and technical themes related to the field of robotics. Interesting subjects will be discussed, including human-robot-collaboration and how robotics can improve industrial productivity and service sector operations.

Researchers, engineers, managers, and a growing number of entrepreneurs, business people, and public funding officers from all over Europe come together to discuss technology push and market pull and how innovation in robotics can be accelerated.

ERF2018 features an exhibition, where companies, universities and research institutes showcase the most advanced European prototypes, products, projects and services.

ERF2018 is not another scientific conference but the one event where roboticists from **over 40 countries** can network during the social events as well. After its start in San Sebastian in 2010, The European Robotics Forum has become quickly **the most popular and influential robotics networking event in Europe.**

Conference Materials:

Projects presentations at the Workshop on Networking for new trends in surgical robotics

Speaker: Riccardo Muradore, University of Verona, Italy

Gallery:

Prof. Riccardo Muradore – Project Coordinator – presents SARAS

Prof. Riccardo Muradore – Project Coordinator

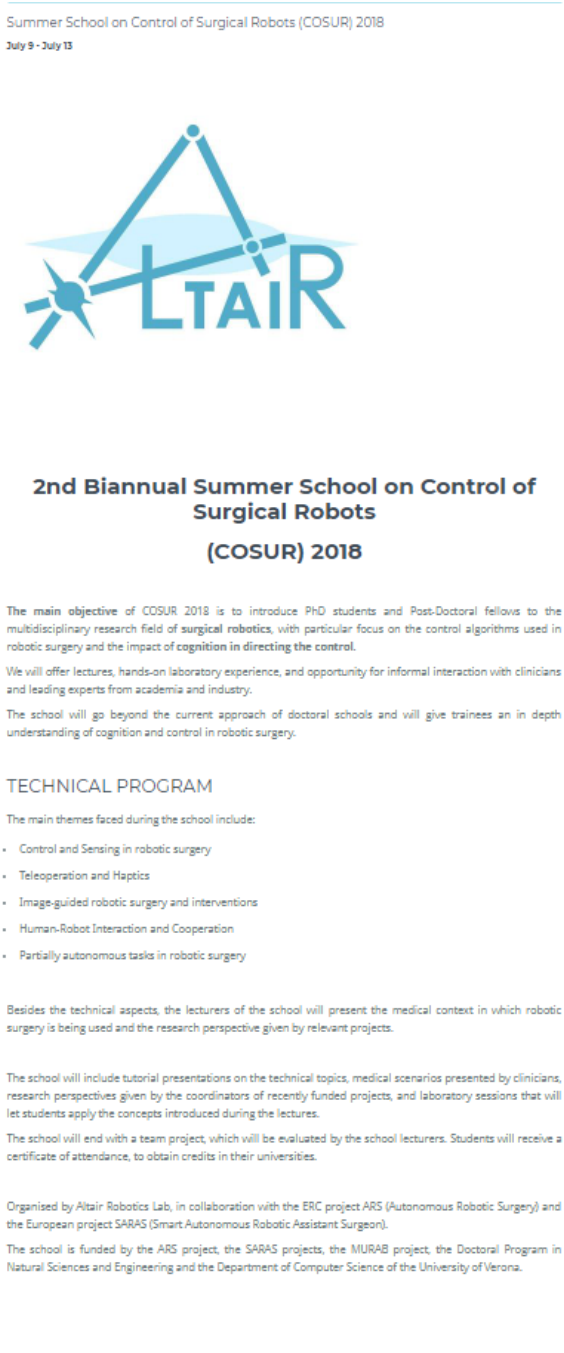
SARAS Poster

Figure 39 - ERF 2018 Event Page

Figure 40 - ERF 2018 Tweet

1.7.4 WORKSHOPS

COSUR 2018: Summer School on Control of Surgical Robots. The main objective of COSUR 2018 is to introduce PhD students and Post-Doctoral fellows to the multidisciplinary research field of surgical robotics, with particular focus on the control algorithms used in robotic surgery and the impact of cognition in directing the control.



Summer School on Control of Surgical Robots (COSUR) 2018

July 9 - July 13

2nd Biannual Summer School on Control of Surgical Robots

(COSUR) 2018

The main objective of COSUR 2018 is to introduce PhD students and Post-Doctoral fellows to the multidisciplinary research field of **surgical robotics**, with particular focus on the control algorithms used in robotic surgery and the impact of **cognition in directing the control.**

We will offer lectures, hands-on laboratory experience, and opportunity for informal interaction with clinicians and leading experts from academia and industry.

The school will go beyond the current approach of doctoral schools and will give trainees an in depth understanding of cognition and control in robotic surgery.

TECHNICAL PROGRAM

The main themes faced during the school include:

- Control and Sensing in robotic surgery
- Teleoperation and Haptics
- Image-guided robotic surgery and interventions
- Human-Robot Interaction and Cooperation
- Partially autonomous tasks in robotic surgery

Besides the technical aspects, the lecturers of the school will present the medical context in which robotic surgery is being used and the research perspective given by relevant projects.

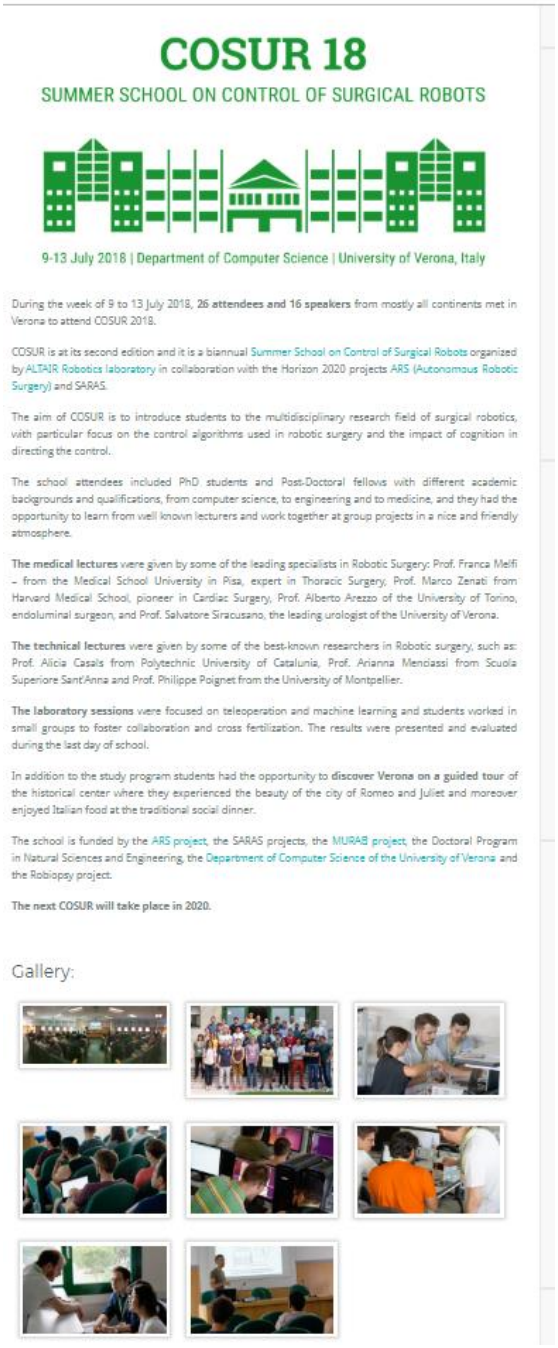
The school will include tutorial presentations on the technical topics, medical scenarios presented by clinicians, research perspectives given by the coordinators of recently funded projects, and laboratory sessions that will let students apply the concepts introduced during the lectures.

The school will end with a team project, which will be evaluated by the school lecturers. Students will receive a certificate of attendance, to obtain credits in their universities.

Organised by Altair Robotics Lab, in collaboration with the ERC project ARS (Autonomous Robotic Surgery) and the European project SARAS (Smart Autonomous Robotic Assistant Surgeon).

The school is funded by the ARS project, the SARAS projects, the MURAB project, the Doctoral Program in Natural Sciences and Engineering and the Department of Computer Science of the University of Verona.

Figure 41 - COSUR 2018 Event Page



COSUR 18

SUMMER SCHOOL ON CONTROL OF SURGICAL ROBOTS

9-13 July 2018 | Department of Computer Science | University of Verona, Italy

During the week of 9 to 13 July 2018, **26 attendees and 16 speakers** from mostly all continents met in Verona to attend COSUR 2018.

COSUR is at its second edition and it is a biannual Summer School on Control of Surgical Robots organized by ALTAIR Robotics laboratory in collaboration with the Horizon 2020 projects ARS (Autonomous Robotic Surgery) and SARAS.

The aim of COSUR is to introduce students to the multidisciplinary research field of surgical robotics, with particular focus on the control algorithms used in robotic surgery and the impact of cognition in directing the control.

The school attendees included PhD students and Post-Doctoral fellows with different academic backgrounds and qualifications, from computer science, to engineering and to medicine, and they had the opportunity to learn from well known lecturers and work together at group projects in a nice and friendly atmosphere.

The medical lectures were given by some of the leading specialists in Robotic Surgery: Prof. Franca Melfi – from the Medical School University in Pisa, expert in Thoracic Surgery; Prof. Marco Zenati from Harvard Medical School, pioneer in Cardiac Surgery; Prof. Alberto Arezzo of the University of Torino, endoluminal surgeon, and Prof. Salvatore Siracusano, the leading urologist of the University of Verona.

The technical lectures were given by some of the best-known researchers in Robotic surgery, such as: Prof. Alicia Casals from Polytechnic University of Catalunia, Prof. Arianna Menciassi from Scuola Superiore Sant'Anna and Prof. Philippe Poignet from the University of Montpellier.

The laboratory sessions were focused on teleoperation and machine learning and students worked in small groups to foster collaboration and cross fertilization. The results were presented and evaluated during the last day of school.

In addition to the study program students had the opportunity to **discover Verona on a guided tour** of the historical center where they experienced the beauty of the city of Romeo and Juliet and moreover enjoyed Italian food at the traditional social dinner.

The school is funded by the ARS project, the SARAS projects, the MURAB project, the Doctoral Program in Natural Sciences and Engineering, the Department of Computer Science of the University of Verona and the Robiopsy project.

The next COSUR will take place in 2020.

Gallery:

Figure 42 - COSUR 2018 News page

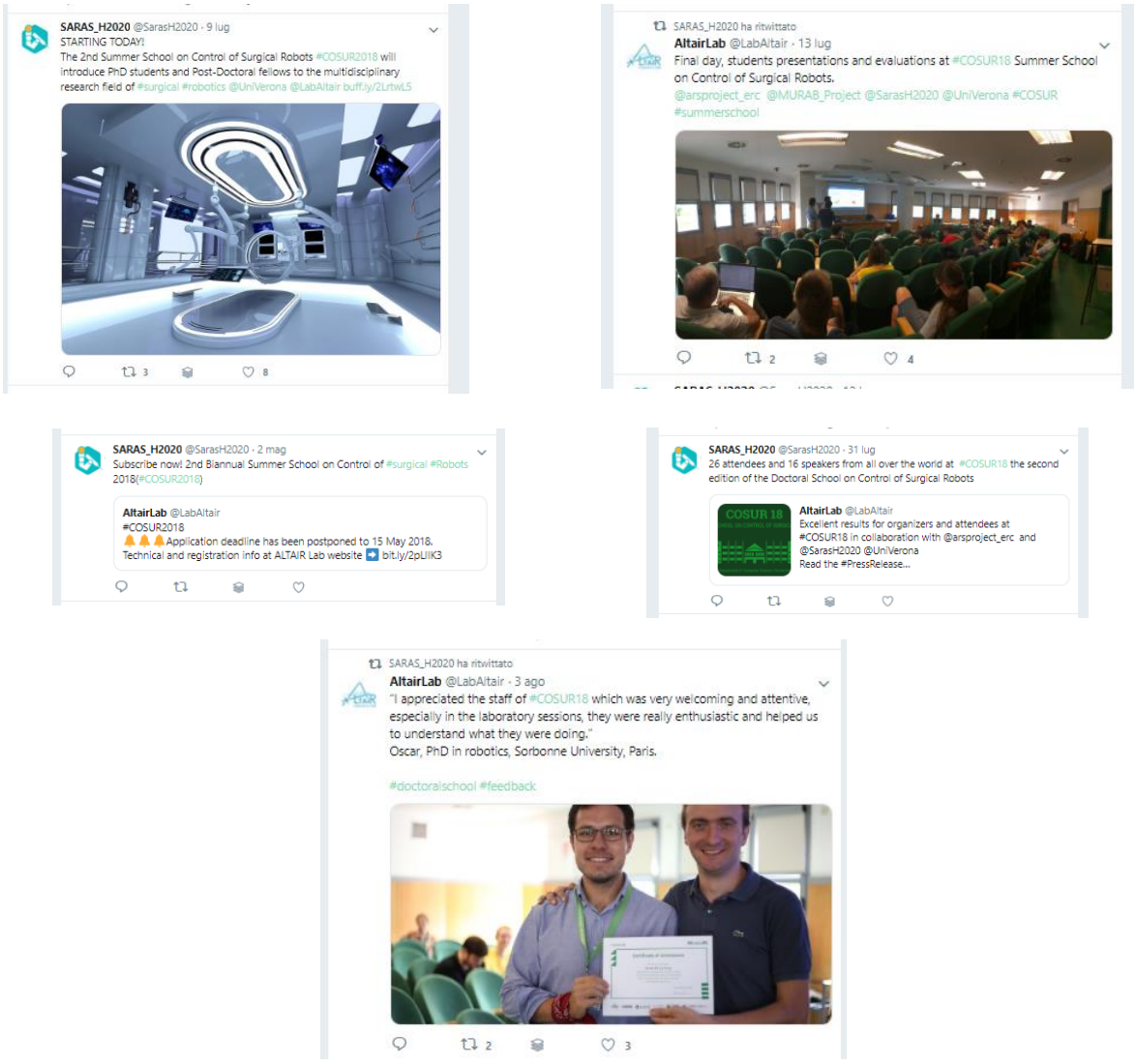


Figure 43 - COSUR 2018 Tweets

MelaTx Workshop - Surgical training held in Sevilla, Spain for Healthcare Experts by UPC.

25 surgeons from all around Spain (10 hospitals from 10 cities) participated in the Course on 7 experimental platforms.

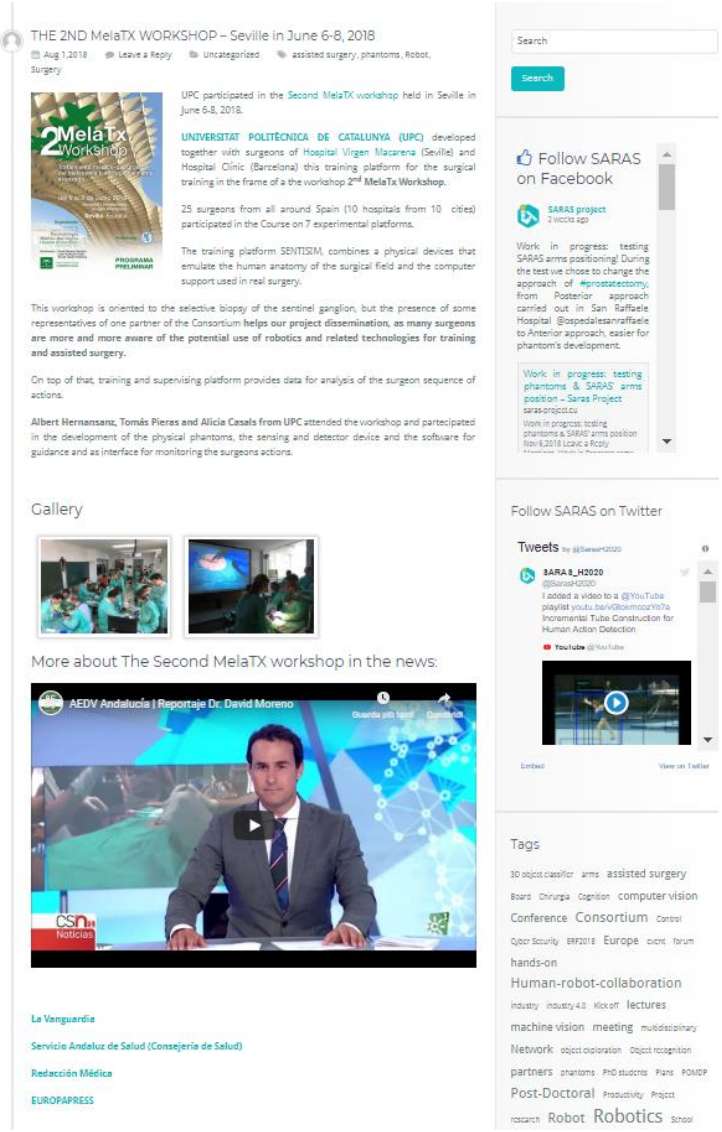


Figure 44 - MelaTX Workshop News Page

Figure 45 - MelaTX Tweet

1.7.5 INTERNAL MEETINGS

SARAS Kick Off Meeting - On January 16 to 17 2018, the SARAS project was officially launched with the Kick off meeting organized in Milan, in the Ospedale San Raffaele.

Figure 46- SARAS' Kick off Meeting Event Page

Figure 47 - KO meeting Tweet

SARAS PROJECT MEETING – The 1st SARAS' Project Meeting held at UPC at Barcelona in Spain on the 25th and 26th September it was an occasion of networking and sharing.

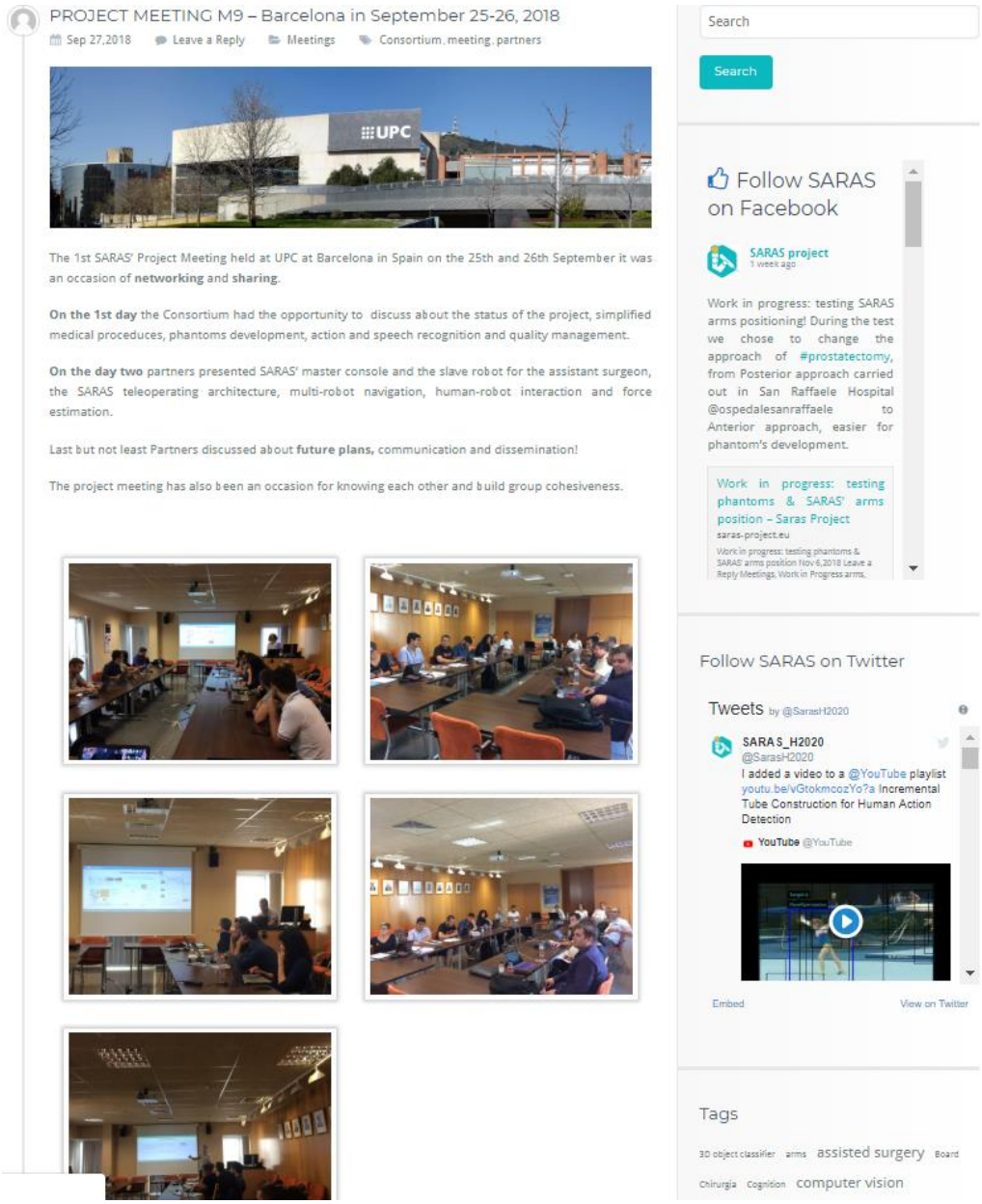


Figure 48 - Project Meeting Event Page

SARAS Testing Meetings - 1st and the 2nd meeting held on the 5th September and the 18th October 2018 at the Department of Computer Science in the University of Verona (Italy).

Figure 49 - News section

A video has been edited to summarize the two meeting testing of phantoms & SARAS' arms position and published in the website – inside the event page, highlighted in the home page and posted on the SARAS' official YouTube Channel.

Figure 50 - Testing Meeting Video

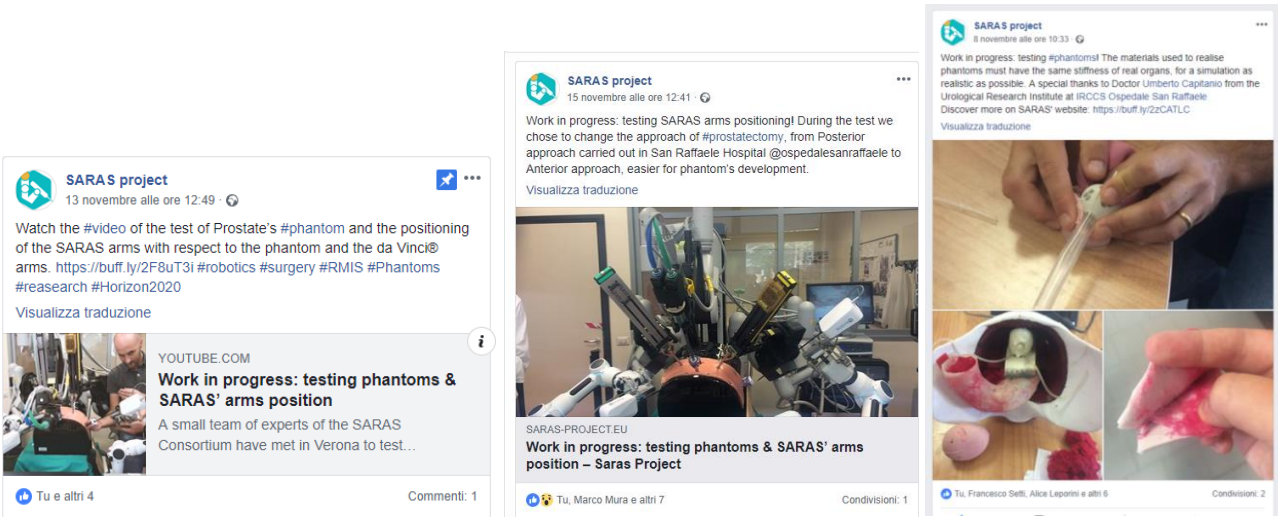


Figure 51 - Meeting posts on Facebook

Figure 52 - Meeting Tweets