SIROM

Public and profession engagement

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1. **OBJECTIVES**

As a mechanism of promoting SIROM project to wider audience, the project has designed a number of events and workshops in order to achieve the following descriptions in the proposal “Organization and participation of the consortium in conferences and events related to the theme of the project”.

The objectives of these SIROM event and conference or workshops are to publicise the project research findings to wider range of audiences in order to increase the project societal impact. These impacts can be an increased interests in science, technology, engineering and mathematics (STEM) from younger generations at school age, attraction of graduate students to pursue a research study, public understanding of the capabilities of space robotic standard interface in future space exploration or in orbit spacecraft servicing, or potentials of SIROM interface on other industrial sectors such as agriculture or nuclear decommissioning or any other environments where reconfiguration and flexibilities are required.

Through these events, in addition to a good record of academic publications produced by the consortium partners, the SIROM project will be able to reach many audiences and let them realize the significance of this first-of-its-kind standard, multi-functional intelligent interface (IF) which could be used both in orbital servicing and planetary explorations.

This deliverable report summarises these events organised and a conference in particular on mechatronics organised by the consortium members.
2. EVENTS AND CONFERENCE ORGANISATION PLAN AND IMPLEMENTATION

Following the SIROM project proposal and expanding these planned activities in most cases the SIROM consortium has organised the following during the project implementation and it is clear that the consortium partners have exceeded the planned activities and achieved better results as a result of their huge effort.

Two main international events are planned: a workshop and a conference. The workshop was also a part of the dissemination and exploitation activities and showcase project outcomes to stakeholders, end users, media and politicians.

Furthermore, consortium members have attended sector conferences as part of the dissemination plan. DFKI organized a presentation and promotion of the project results in the International Astronautical Congress (IAC) 2018, which took place in Bremen.

Videos, pictures and brochures have been produced over the whole duration of the project implementation to present the latest state of development beginning with CAD drawings as well as animations of first concepts and ending with a compilation of the final test campaign.

Finally, as the SIROM moves to a new phase after its completion, the project partners have started to plan further public engagement activities either in the successful bids for the Call 2 of the Horizon 2020 Strategic Research Cluster in Space robotics technologies. They have also planned to promote SIROM in their other projects which is detailed in this report.

2.1 An Industrial and International Engagement Event in Madrid

The International Symposium on Artificial Intelligence, Robotics and Automation in Space (i-SAIRAS) is a long running international event. This specialist symposium is devoted as an academic exchange platform to the latest advancements of technologies of Artificial Intelligence, Automation and Robotics and their particular application in broad space industry and exploration. In 2018 this Symposium as its 14th in this series of international symposia was moved to Spain and was hosted and organised by the i-SAIRAS 2018 International Executive Committee and the i-SAIRAS 2018 Spain Local Organizing Committee. The symposium took place in Hotel Ayre Gran Hotel Colón Madrid, Spain.

Below in Figure 1 is a screen capture of the Symposium front page.

Further details of the Symposium can be found at:

As part of this Symposium, SIROM project coordinator collaborating with the i-SAIRAS 2018 organiser planned, an Industrial and International Engagement Event at SENER in Madrid. This event has attracted a wider audience interests from over 100 international delegates attending the International Symposium on Artificial Intelligence, Robotics and Automation in Space (i-SAIRAS 2018).

Figure 1 The Symposium website of the International Symposium on Artificial Intelligence, Robotics and Automation in Space (i-SAIRAS)
The delegates were divided into three groups and visited SENER to learn more about the SIROM project and the company. A partially assembled prototype system has been on display for delegates to view the future European space robotic connector. This event truly promoted the SIROM to international experts from USA, Europe, Japan, China and other space nations.

During the visit, SIROM project Coordinator Mr. Javier Vinals and the Manager Mr Eduardo Urgoiti gave an extensive talk on both the company and the SIROM project. Several project consortium members also attended this industrial and international engagement event and promoted the SIROM to a much wider and targeted audiences.

At the event, SIROM components and their sub-assemblies were shown to all international delegates and these have attracted much interests from these delegates.

Delegates were also shown the research and production facilities at SENER, Madrid.
This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 730035.

2.2 Workshop 1: A concurrent Engineering workshop

A concurrent Engineering workshop has been organised at SAS in Brussels in November 2017. At this workshop, all partners have discussed critical requirements and a publicity section on website will be added in addition to the news article we have produced.

The workshop organised by Space Application Services was designed to allow all consortium participants from all disciplines to work together on the design choices of SIROM and identify how they would impact on the global system's functionalities, performance and design complexity.

The objective of the CED workshop was to address the technical challenges and plan and have common understanding of an anticipated SIROM design. This was achieved by having interactions at technical level among the partners and to allow them to present clarifications in support to the CED activities.

As the scenarios of the Planetary Exploration Track is more challenging than the ones of the Orbital Track, the workshop focused on the set of operational scenarios to be run for that particular track. The lead organizer, Space Applications Services, presented the storyboard and executed the scenarios on a step by step basis that enabled to detail the functional requirements of the whole SIROM system at each step of its execution.

Partners were invited to explain how their subsystems covered the needs or needed to be adapted to cover the needs or how the operational scenario had to be adapted to address subsystems limitations. Issues were identified during the first day and the whole set of operational scenarios were covered. A number of splinter meetings were organized between partners to solve some open issues, to further explain how their subsystems intended to work and to refine the interfaces between subsystems.

During the CED workshop, more than 30 topics requiring a clarification were addressed by the team that had also the opportunity to discuss the pros and cons of proposed solutions. About half of the open points could be discussed and closed during the CED workshop due to excellent team interactions. Further actions and points requiring a more in depth analysis were then addressed and resolved after the workshop by teleconference.

Figure 3 Real SIROM prototype system has been revealed at this industrial and international engagement event at SENER
2.3 Mechatronics 2018: Reinventing Mechatronics

Mechatronics 2018: Reinventing Mechatronics, was held successfully in Sept, 2018. The conference was organised by University of Strathclyde, with the support of Institution of Mechanical Engineers (IMechE) and Intuition of Engineering and Technology (IET) Robotics & Mechatronics TPN. This conference was also endorsed by the PSA and the SIROM consortium to advance mechatronics in space robotics. The conference provided an international forum for professionals, academics, and researchers to look back at the role of mechatronics and its technological development since its inception, to consider the latest developments from a wide range of interdisciplinary theoretical studies, to review applications of mechatronic systems, including in particular current developments such as space robotics and Cyber Physical systems along with other emerging fields. The latest developments in selected applications in space, advanced manufacturing have been the focus of the conference and international and industrial leading presenters were invited to kick-off discussion and presentations of the conference. The highlight of the Conference is a talk given by Mr. Stephen Sanders from Oxford Technologies Limited and Mr. Nigel Kellett from AXON Cable Ltd gave a talk on Trends and evolution of space harness technology and satellite wiring.

The three days conference was attended by around 60 delegates. Delegates were from Europe, USA, China, South Korea, and middle east.

Four international keynote speakers delivered keynote presentation on space connectors and harness in satellites and space robotics, the challenges for mechatronics in nuclear decommissioning and disaster management, and Industry 4.0. The delegates discussed the SIROM project for potential collaboration with Axon Cable Ltd and other companies.

One e-book entitled REINVENTING MECHATRONICS Proceedings of MECHATRONICS 2018 with an ISBN number: 978-1-909522-37-4 (e-Book) was published. Another book is to be published by Springer based on selected papers with extended and new materials in 2019. SIROM project was discussed among the delegates.

Figure 4 A screen capture of the 2018 Mechatomics conference website

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 730035.
A further workshop was planned as part of Reinventing Mechatronics: 16th International Conference on Mechatronics 2018. Due to a clash with International Astronautical Congress held in Oct 2018, this workshop has not attracted sufficient papers. Instead the consortium decided to develop a public engagement week-long event by hosting mostly and contributing to a public engagement booth which exhibited the research and development work for all Operational Grants of the Strategic Research Cluster in Space Robotics, in which SIROM contributed most and the Consortium Partner DFKI brought along a mobile robot Coyote as a demonstrator to increase the attraction of the booth and also provide a demonstration robot for better engagement with both professional delegates of the IAC Conference as well as the general public.

2.4 A public engagement event at IAC 2018

The 69th International Astronautical Congress (IAC) was held in Bremen, Germany, from 1-5 OCT 2018. A well-represented SIROM consortium team joined PERASPERA team and other Operational Grant (OG) teams shown in Photo 1 to promote the research and development outcomes of all six OG’s achievements so far in a dedicated exhibition booth hosted by the DFKI. This exhibition booth has attracted a lot of interests from both IAC delegates and general public on Germany’s national holiday on Wednesday 3rd Oct 2018.

Figure 5 A team photo of PSA members and representatives from all OGs manning the booth for five days.

SIROM team in Figure has been very active in promoting SIROM and other OG’s activities and it is worth mentioning that Ms Wiebke Brinkmann was particularly popular with younger visitors at the booth on the Germany’s National Holiday with the two groups she was talking to.
2.5 A public prestige lecture: A review of current European Space Robotics Research

After receiving an invitation from the Institution of Mechanical Engineers (IMechE), the SIROM Consortium Dissemination and Exploitation Manager Professor Xiu Yan from the University of Strathclyde gave a lecture for a wider London based public prestige lecture. The lecture was organised by the Mechatronics, Informatics and Control Group of the Institution of Mechanical Engineers. The research work undertaken within SIROM was promoted by using this platform. There were 67 registrations for the event and it was very well received.

At this Prestige lecture, Prof. Yan disseminated and introduced the preliminary SIROM project outcomes, space exploration challenges in both planetary missions and in-orbit servicing. He then briefly introduced the European Commission funded six major projects in strategic robotics research. In the lecture he provided an overview of SIROM project and the progress made so far. Further in-depth content on SIROM project on standard robotic interface, which is intended to be a building block to the future of space robotics research. Finally he discussed future space robotic challenges. More details can be found at: https://events.imeche.org/ViewEvent?code=TEL6541

This lecture was a success and IMechE has invited Professor Yan to give a webinar based and recorded lecture in the future.

2.6 Conference attendances and project promotion

In addition to the above public engagement through these event, workshops and conference, the SIROM consortium members have also been active attending the following conferences:

1. Symposium on Advanced Space Technologies in Robotics and Automation (ASTRA), which was held on 20-22 June, 2017, Netherlands. The full paper and presentation file can be found at: https://robotics.estec.esa.int/ASTRA/Astra2017/
2. The 68th International Astronautical Congress (IAC), which was held on 25-29 September, 2017, Australia;
3. 23rd International Conference on Automation and Computing (ICAC’17), Huddersfield, 7-8 September, UK;
4. 14th International Conference on Informatics in Control, Automation and Robotics – July 2017 Madrid, Spain;
5. 2017 NASA/ESA Conference on Adaptive Hardware and Systems (AHS), Pasadena, CA, USA, 24-27 July 2017;
6. The 2018 IEEE Aerospace Conference, 03.3.-10.3.2018, Big Sky, Montana, USA, IEEE, 2018;
7. The 69th International Astronautical Congress (IAC 2018), October 1-5, Bremen, Germany, International Astronautical Federation (IAF), 2018

Below are some examples of the attendance and presentations given by the consortium members. Mr. Javier Vinals Figure 7 gave an overview of SIROM project by presenting a paper entitled Future space missions with reconfigurable modular payload modules and standard interface - an overview of the SIROM project. His presentation was well received and appreciated by audience.

![Figure 7](image_url)

Figure 7  Mr. Vinals is presenting a paper entitled Future space missions with reconfigurable modular payload modules and standard interface - an overview of the SIROM project
Figure 8 Interactive Presentation for paper entitled future space missions with reconfigurable modular payload modules and standard interface – an overview of the SIROM project

Mr. Gonzalo Guerra Franco in Figure 8 delivered the interactive presentation shown in Figure Photo 5 on Multi-functional interface for flexibility and reconfigurability of Future European Space Robotic Systems. A number of questions were asked and a really good interaction took place during this presentation using the state of the art presentation facilities, including videos, animations and audio and more importantly live presentation.

2.7 International collaboration

Royal Society of Edinburgh and National Science Foundation China organised a Robotics and Artificial Intelligence Workshop at the Royal Society of Edinburgh. Project partner from Strathclyde have been invited to give a talk in which SIROM project was briefly introduce to Scottish and Chinese delegates as part of activities of SMeSTech lab.
3. FUTURE PLANNED FOLLOW-ON ACTIVITIES OF PUBLIC ENGAGEMENT

Building on SIROM project, the consortium partner will be involved in space robotics projects in Horizon 2020 Call 2 of the Strategic Research Cluster and some of the project partners have already start to plan further public engagement activities.

In addition, the SIROM project partners are also involved in other future projects and there will be opportunities for those partners to take a part of public engagement activities. As an example, the University of Strathclyde has been awarded an Interrug project called Indu-Zero, which involves all North Seas regional countries to work on a robotic project to develop a blueprint for future automated production using robots to make key construction components for renovating old and inefficient social housing in these North Sea countries. It is planned to have a meeting in Jan 2019 and it is proposed to run a small workshop/Seminar to introduce SIROM at this workshop and introduce some of SIROM work to construction industry.
4. ACRONYMS LIST

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<td>EAC</td>
<td>European Astronaut Training Centre</td>
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Table 1-1 Acronyms list