SHORT TERM SCIENTIFIC MISSION (STSM)
SCIENTIFIC REPORT

This report is submitted for approval by the STSM applicant to the STSM coordinator

Action number: CA19102
STSM title: Using Robotics in Order to Acquire Skills
STSM start and end date: 19/07/2021 – 23/07/2021
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PURPOSE OF THE STSM:

The main aims of my short-term scientific mission (STSM) as stated on the initial proposal was comprehending and observing the use of non-traditional technological tools for language learning such as robotic devices, rehabilitation devices and virtual reality tools and exchange ideas and good practices regarding the use of robotics tools in order to benefit the language acquisition. Furthermore, the STSM aimed to inspire dialog and collaboration between experts. The expected outcomes of the STSM where: observing the use in the field of implementationof those tools, take notes regarding the use, meet the creators, designers, engineers, neuroscientists, users of the tools and visiting the offices and the labs.

During the STSM I had the chance to visit for five days the Italian Institute of Technology and more specifically I focused my visit in one of the four domain of research – Robotics https://www.iit.it/robotics. The domain of Robotics advances the state of the art by developing new robotic platforms in hardware and software. More specifically during my scientific mission I was at the laboratories and offices of:

- The Unit for Visually Impaired people https://www.iit.it/it/web/unit-for-visually-impaired-people?fbclid=IwAR0sUnZcDk7-JQetec8DKA1n4SQZK2FGDa5s2-28P5BL7HgBHGMP2w4eGFM
- The department of Cognitive Architecture for Collaborative technologies https://www.iit.it/web/cognitive-architecture-for-collaborative-technologies and more specifically the offices and the labs of:
- Psychophysics Lab
- Children rehabilitation Lab
- Cognitive Robotics and Interaction Unit
  - Motor Learning, Assistive and Rehabilitation Lab
  - Motion Capture Lab
  - Dynamic touch and Interaction lab
- The department of Robotics Brain and Cognitive Sciences

During my STSM I had the chance to observe directly the use, the tests, the demonstrations, the programming, the project implementation of a variety of robotic devices (iCub, Hand-Arm Robotic Platform etc.) designed, created, and manufactured in the Italian Institute of Technology. Furthermore I was able to discuss the challenges, the needs, the possibilities, the ethical perspective of implementing this type of interactive technology (Robotics and Vr) into the process of teaching, learning and language teaching. Finally the possibilities of future collaboration are discussed.

DESCRIPTION OF WORK CARRIED OUT DURING THE STSMS

During the 1st day of my STSM 19.07.2021 I oriented my self in the area, the buildings, the Departments and Units that I spend my STSM.

During the 2nd day of my STSM, 20.07.2021, I visited the *Unit for Visually Impaired People* https://www.iit.it/it/web/unit-for-visually-impaired-people. The main aim of the Unit is to early identify spatial impairments that impact life of visually disabled people and build innovative solutions to prevent the risk of developmental delays. In particular the Unit investigates and identify solutions, relating to the integration between sensory and motor signals and how the absence of one sensory modality impact the development of other sensory and motor signals and test and validate the devices. In the Unit I had the chance to be present at equipment and project demonstrations (http://www.wedraw.eu/ and https://www.abbiproject.eu/). Moreover I met, discuss, addressed questions and exchange ideas with 6 professionals that works in the Unit (senior researcher, researchers, investigators, senior technician, Post Doc students).

During the 3rd day of my STSM, 21.07.2021, I was present at the R*obotics Brain and Cognitive Sciences Unit* and more specifically at the *Cognitive Robotics and Interaction and Motor Learning, Assistive and Rehabilitation Robotics Lab* at the demonstration and programming of the *iCub* robot https://www.iit.it/it/web/icub/. iCub is a humanoid robot designed to help developing and testing embodied AI algorithms. I was able to understand how the robot operates, the way that interact with the objects, the persons and the environment and how it can manage to perform communication signals such as face expressions, hand movements, feelings recognition etc. Furthermore I performed a bibliography research regarding the iCub robot in order to collect more informations regarding the capabilities and a possible educational use of the robot and discuss with professionals about the capabilities and the limits of the robot.

During the 4th day of my STSM, 22.07.2021, I visited the *Dynamic touch and Interaction lab* where I had the chance to observe the use of the KINOVA JACO ROBOTIC ARM and discuss the capabilities of the platform. Furthermore in various meetings with the researchers, the educational extension of the use of the technological tools of Robots and the challenges of this impelementation, the difficulties that the designers, the engineers, the programers could face in a complicate process such as the teaching and learning process was discussed. Moreover special focus on the Language learning direction was made.

During the fifth day of my STSM, 23.07.2021, I was at the Motor Learning, Assistive and Rehabilitation lab, where I had the chance to discuss with experts on the field regarding the complicity of the process of skills acquisition through robotics, the different aspects that must be considered and the simulation of the human behavior to a robot in order to reproduce commands. Futhermore I was present at two meetings regarding possible future colaborations.

DESCRIPTION OF THE MAIN RESULTS OBTAINED

My STSM was entitled *Using Robotics in Order to Acquire skills* and during my permanance in Italian Institute of Technology I was able initially to perform a general and later a more specific targeted to the aims of the mission visit.
Initially I observe and comprehend the procedure and the multidimensional process of the interaction of the robot with the environment, humans and objects. I focused my atention to skills and comunication aspects, non verbal comunication, the collaboration and interaction aspects, and how a variety of non verbal communication signals of the robot, may interferes with the trasmiting of the message (gestures, body language, facial expressions) etc. Moreover I observed the process how the creation, the design and the programming starts form the initial investigation of the human skills and the donation to the robots of the same degree of predictivity and perception that characterizes humans, enabling them to understand and adapt to the other's feelings, goals and needs.
In order for the goal to be achieved human behavior, human skills (motor and cognitive) were investigate. Finaly I was able to examinate the possibility of integration in the teaching and learning process of non traditional technological tools like robots, robotics platforms and VR tools and discuss the possibilities, difficulties and challenges. Teaching and learning process is a complicate a delicate process that requires a lot of parametres to be considered.
As stated on the initial report the personal motivation of organize a STSM is the luck of use those specific tools in teaching and more specifically in the field of language learning and the need of skills acquisition through robotics. Through my visit I examinate and discuss the reasons of the luck of those specific tools in teaching. Furthermore, the need of implementation and understanding the potentials, the difficulties and the challenges of the implementation of those tools is essential as it represent the foundation of including those tools into the process of teaching and learning.

FUTURE COLLABORATIONS (if applicable)

Possible future collaborations of 2 different types were discuss during the STSM:

- With the *Unit for Visually Impaired People*, based on the use of robotic devices, (meetings on the 4th and the 5th day of the STSM).
- With the *COgNITive Architecture for Collaborative Technologies* in the area of Research Programmes (meeting in the 5th day of the STSM).