SUITCEYES

Season’s greetings from SUITCEYES

The year is nearing its end and the festive mood is in the air. We therefore celebrate 2019 with a few highlights and updates from SUITCEYES. We also wish you all a Merry Christmas and a Very Happy New Year.

For SUITCEYES, 2019 marked the second year (out of three) of the project, and was a very full and intensive year. Our consortium continued research and worked on bringing different parts of the project together in preparation for the sprint that is to take place in 2020.
Our work included (among others):

• Concluding an extensive (if not the largest of its type) user-study comprising 81 interviews with 79 participants in five European countries. The participants were mostly people with deafblindness, but we also interviewed some experts, family members and support people.
• Developing algorithms and technologies that enable detection and recognition of objects, faces, scenes, third person activity-related gestures, obstacles, and safe-areas.
• Carrying out a series of important psychophysics tests relevant to perception of stimuli on the human body.
• Creating updated prototype garments.
• Developing and testing gamified learning experiences.
• Initiating policy studies in five European countries (Sweden, UK, Greece, NL, Germany).

• Dissemination activities to keep interested parties informed about the progress within the project and more.

Meetings, work and information

2019 witnessed multiple instances where our consortium got together to either engage with interest groups and stakeholders or to continue research and development work within SUITCEYES. The culmination of these events was a well-received symposium, titled "Haptic Communication – Breaking the Barriers for Inclusion and Participation" which took place in Borås on August 22nd 2019.

The organization of the event was supported financially by FORTE (the Swedish Research Council for Health, Working Life and Welfare). The symposium addressed deafblindness from a number or perspectives: personal experiences, policies, science and technology research and linguistics amongst others. More than 85 participants attended the symposium.

The day started with a brief introduction into the SUITCEYES project, given by Nasrine Olson. Then Director-General of the Swedish Agency for Participation, Malin Ekman Aldén, took the stage to discuss national policies on participation, accessibility and inclusion, followed by Klas Nelfelt, Vice President of the World Federation of The Deafblind, who presented the work conducted at WFDB.

The day continued with inspiring presentations by Carlo Geraci, Director of the IJN sign language group; Riitta Lahtinen and Russ Palmer, leader and member of the Social Haptic Communication research group; Cathrine Timm Sundin communication adviser at Eikholt; Sophia Alexandersson CEO and artistic director at ShareMusic; and members of the SUITCEYES consortium presenting recent progress within the project.

The final point in the program was a presentation on EU funding and research for inclusion by Pawel Dobosz, Programme Manager at European Commission. The day concluded with a cultural engagement in the form of enthralling Japanese taiko drum music performed by Sweden Taiko followed by a reception and guided tours of the textile showroom and textile labs at the University of Borås.

We are happy to report that feedback received by the participants after the end of the symposium was overwhelmingly positive.

Consortium meetings

Our consortium convened three times during 2019.The first of these meetings took place April 15-17, at the partner organization CERTH, which is situated in Thessaloniki, a city with 2.400 years of uninterrupted history in Northern Greece.

A main focus of this particular meeting was to ensure smooth integration of the work so far conducted within the project with the aim to meet the goals defined for the project's mid-point mark. Another important element for this meeting was to have a collective discussion about the user personas and scenarios (defined by the user-study interview data), which were to guide the decisions for and define the priorities of the SUITCEYES prototype development.

(This meeting was also followed by another gathering in Thessaloniki in early June involving only those members who work on the technical developments in the project. That meeting was dedicated to bringing together all the different components of the first-generation prototypes in preparation for achieving the goals set for project mid-point.)

On the side of intensive work during the day, during the evenings our consortium got to enjoy a tour of the historic city as well as experience Greek cuisine.

Our second consortium meeting in 2019 took place August 21-23 at HB (project coordinator) in Boras, Sweden. Borås a city with strong roots in the Swedish textile industry. There were multiple aims for this consortium get-together. The first day was spent on reviewing the progress within the project and updating the project advisors about the recent progress within the project. The day also involved user participation, prototype testing and audience feedback. The second day was dedicated to the symposium "Haptic Communication – Breaking the Barriers for Inclusion and Participation", which entailed networking, user involvement and stakeholder feedback. Finally, the third day was dedicated to meeting with the Project Officer and EC appointed Project Reviewers for a formal evaluation of the project. Very interesting and constructive discussions pursued providing the project members with insights and expert external feedback on the project achievements.

The third and final consortium meeting of 2019 took place December 5-6 at another partner organization, HSO, which is situated in Offenburg, a small city in South Western Germany positioned at the foot of the Black Forest and with close proximity to France. As usual the recent progresses were presented and discussed and preparations were made for the many reports due shortly. However, the focal points in this consortium meeting were three separate co-constructive co-design workshops that involved three users all experts in their particular field including a person with deafblindness, an expert in social haptic communication design, and an interpreter with expertise in social haptic communication use. Three co-design, co-construction workshops took place involving brainstorming, role-playing, analogies, reverse thinking, etc., on the following topics (a) adaptation of Social Haptic Signs towards SUITCEYES actuator-based haptic patterns; (b) new game scenarios for learning and enriched experiences; (c) situational feedback, deemed as useful or needed from a user-perspective. The results of these ideation exercises are currently being evaluated and analysed

Prototypes

The first, early stage SUITCEYES prototype (in the form of a red dress) was developed and presented already in mid-2018. In 2019 newer more advanced prototypes were developed, at this stage mainly to experiment with possibilities in terms of textile design, but also as flexible test-beds for development of different components; user-involvement and testing; and for psychophysics experimentations. So far, in addition to the early red dress, there are also a black dress (demonstrating the sophisticated ways in which electronic elements can be placed in or on textile), a green vest (that incorporates Velcro, magnets and more to allow fast, easy, and flexible (re)placement of electronic units on the vest), a chessboard vest (that is intended to fit all body forms and sizes and which allows for easy and flexible placement of extensive number of actuators in various combinations and distances, mainly used for psychophysics experiments), a black vest (with additional features for use in gaming experiments) and an easy to use test-bed that can be placed on the back of any chair, i.e., rather than having to wear a garment, the user can feel the haptic signals on his or her back, simply by sitting in this chair to be used for flexible (user participatory) design and experimentations.

The white straps on the inside of the dress consists of pockets to place actuators that then can convey signals to the users as haptic signals displayed on the back in a matrix setup.

From the outside the cord attached to the actuator can be pulled through an eyelet so that the cables could be placed on the outside of the garment, away from the user's skin. The eyelets are covered by crosswise straps of fabric to not make too much of an obtrusive aesthetic look.

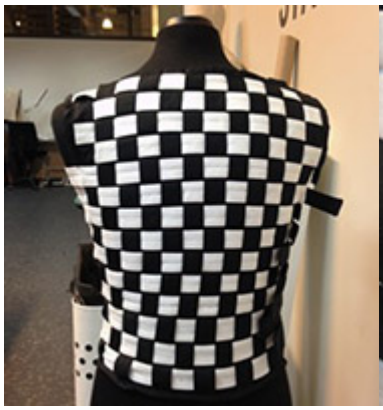
The seams have been used to make integrated cords (green).

The front of the dress also has the integrated cords in the seams (green).

The eyelet that is connected to the pockets on the inside of the garment is here visible on the sleeve.

On the front is an option on how to place the camera and line laser setup that needs to be in a fixed position in the front of the garment.

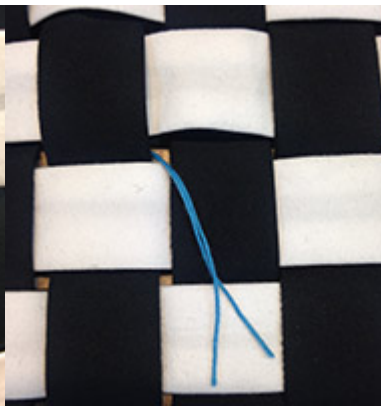
The front of the vest is versatile in size in that every crosswise strap can be individually adjusted to provide customized size. The shoulder straps are adjustable.



The back of the vest consists of straps in a plain weave construction, providing a great freedom in placement of actuators.

The inside of each strap is made out of velcro, the actuators are then placed in a pocket also made from velcro, and hence the two can be attached to each other.

Since the straps are woven together, the placement of the actuators can also be done when the vest is dressed on a person.



Example of how the cords can run on the outside when an actuator is placed.

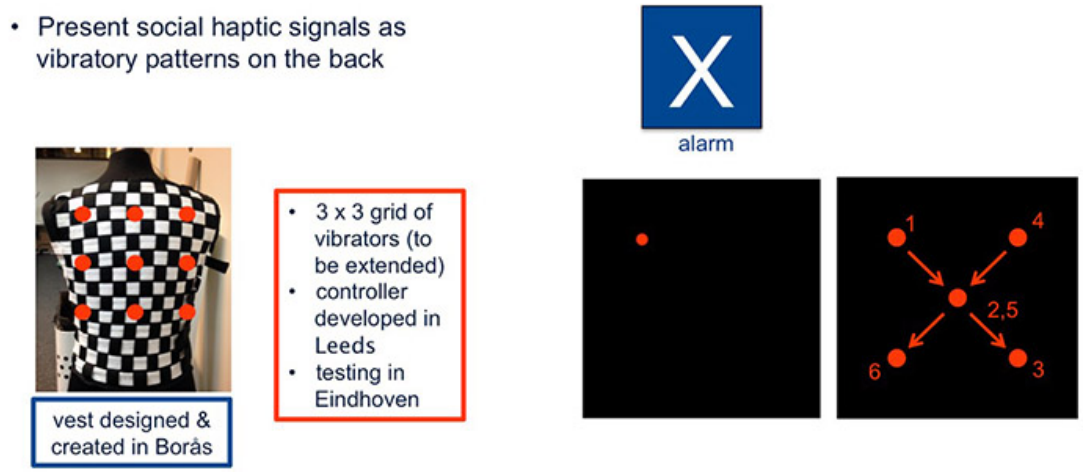
Demonstrations

Computer vision – Each of the prototypes is aimed at highlighting different capabilities of what we anticipate the final prototype will be able to perform at the end of the project. One of the prototypes, hosting a set of sensors and a camera demonstrates perception and navigation abilities. This can be seen in a recording prepared by the project members from the partner organisation CERTH which demonstrates object detection and tracking using a wearable chest-mounted camera. The algorithm works efficiently by detecting the objects first, using a deep Convolutional Neural Network (CNN), and then tracks the detections for a short period of time.

For the purpose of detecting objects of interest, deep image representations were extracted from a CNN and pixel coordinates of bounding boxes were predicted using a deep CNN object detector. To this end, a modification of the accurate Faster-RCNN is adopted. The different object classes are

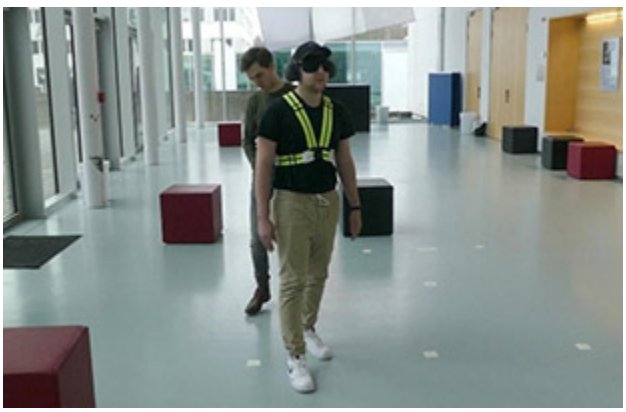
represented in the video using different bounding box colours while a person performs a certain activity, in this case washing the dishes. (Acknowledgement: Original video is taken from the ADL dataset.

Haptic communication – When it comes to the chessboard vest, as well as enabling various experimentation and tests, it has also been used to demonstrate the possibility of social haptic communication via vibration motors on a vest. For example, at one of the meetings with the project advisory board, several vibration patterns were constructed on user's backs to emulate social haptic signals. Two of our advisory board members with deafblindness tested the prototype and were able to recognize the haptic signals conveyed on their backs. This is a positive step towards presenting people with deafblindness with social haptic signals through vibration.



Both these prototypes can be seen in action at Youtube.
See the film »

Gamification



Gamification plays an important role in SUITCEYES, not only in terms of creating learning interplays and enjoyable interactive experiences for the users but also in terms of learning how to use the haptic interface that is being developed in the project.

In January and March 2019, the members from Offenburg University (Germany) conducted field studies with a total of 25 participants, testing another wearable prototype used for gamification experimentations.

The wearable comprised of six vibrating elements placed in a 360° configuration around the waist with each element 60° apart from one another. This resulted in two actuators each at the front and back, and one each on the left and right. The actuators, connected to an IoT board with BLE capability, were triggered manually via a mobile application on a smartphone by a member of the research team. The participants were asked to navigate through four different routes guided only by the vibrations of the wearable. The routes themselves consisted of four obstacles and four "checkpoints".

When walking through a checkpoint all actuators would vibrate, indicating that a participant was progressing well along the course. With the effects of gamification being of particular interest, the participants navigated through the routes twice with checkpoints and twice without, to examine whether they had any impact on their performance.

Additionally, the speed of the participants was analysed by timing the participants using a stopwatch. This was especially interesting to evaluate whether the participants experienced a learning effect while wearing the prototype. Upon completing each route, the participants were asked to fill out a questionnaire which included questions regarding their performance and the gamified feature of the prototype.

Deafblindness was simulated by covering the eyes and ears. All in all, the study not only proved to be an important step in our development but was also a very exciting experience for all involved. The students really enjoyed taking part in the study and testing out the prototype.

A further study was conducted in mid-November, this time involving four individuals each with varying levels of deafblindness. The participants tested the "Follow Your Partner" game, where each participant walked through a predefined route twice.

Although the analysis is not yet complete, the initial results are very promising, with each participant completing the route and stating that the gamified scenario was fun. The wearable prototype vest designed for these experiments (the black vest) is equipped with a fisheye camera that can detect markers that look similar to QR codes. Through visual analysis the system can detect how far the wearer of the vest is from the marker, and also the angle between the camera and the marker. With these two factors the system can vibrate at point-specific locations on the vest that indicate the direction the wearer of the vest should walk towards. Distances are conveyed through frequency, where shorter vibration frequencies indicate that the wearer of the vest is very close and slower frequencies indicate that the wearer is farther away from the marker. In a follow up questionnaire, the participants stated that they could perceive the frequency of vibrations very well and could adjust their distance to the marker accordingly.

The vest is also equipped with micro-servo motors: two on the front of each shoulder, and two on the back of each shoulder. These motors would generate a tapping effect whenever the person playing the suspect in another game, called "keep your distance" was facing the wearer of the vest. However, the study showed that the participants could not perceive this modality very well (which could be due to insufficient contact with the body, as well as, the motors not being powerful enough, something that will be investigated further). The learning effect was evident as the participants reported that they could navigate more easily and felt more comfortable during the second trial of the study. There are also other games (e.g., Easter Egg Hunt) that have been designed and experimented with.

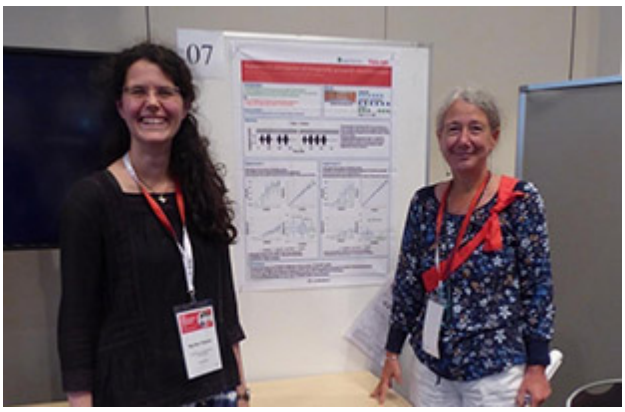
Dissemination

SUITCEYES was present on several conferences and fairs throughout 2019. Indicatively, SUITCEYES partners attended:

- ATIA Conference in Orlando, USA
- CSUN AT Conference in Anaheim, USA
- SightCity Fair in Frankfurt, Germany
- Na Tak Conference, Poznan Poland
- "Inclusion and Exclusion in the Welfare Society"

We are happy to report that SUITCEYES attracted considerable interest in these venues.

SUITCEYES presentations at academic venues



Myrthe Plaisier presented a SUITCEYES research poster at the World Haptics conference in Tokyo in July 9-12, 2019 (read more about the conference), together with Astrid Kappers from Eindhoven University of Technology and Raymond Holt from University of Leeds. The IEEE World Haptics Conference is the major international conference on all aspects of haptics. Out TU/E colleagues demonstrated results of their study on numerosity judgment of vibration pulse sequences. In this study they attached a small vibration motor to the forearm and created a vibration pulse sequence by switching the motor on and off in rapid succession. Especially for larger numerosities it proved difficult for subjects to judge the number of pulses. Thus, researchers found that judgement of the number of vibration pulses to the forearm can be facilitated considerably by temporally grouping the vibration pulses. For example, three series of three pulses was much easier to perceive than nine pulses in one series.

We are happy to report that, out of 90 work-in-progress submissions, the SUITCEYES poster finished in the Top 3 for best contributions!

SEMAPRO 2019 Conference in Porto

A special track coordinated by project partners CERTH and HB passed peer-review process and was included at the SEMAPRO 2019 conference. This special track, titled "SyMpATHY: Semantic Technologies for Healthcare and Accessibility Applications", took place on September 24th in Porto, Portugal. As its name indicates, the special track aimed to serve as a venue for presenting and discussing novel ideas, experiences and open problems in the application of semantic and web technologies in the domains of healthcare and accessibility. The SyMpATHY track was coordinated by colleagues Dr Efstratios Kontopoulos (CERTH), Prof. Em. Sándor Darányi (HB) Dr Marina Riga (CERTH) and chaired by Dr Nasrine Olson (HB). four peer-reviewed papers were presented and discussed as listed below:

A Data Referencing Formalism for Information Exchange between Deafblind People and Databases [Author: Carlos Seror; Presented by: Carlos Seror]

Static and Dynamic Haptograms to Communicate Semantic Content [Authors: Sandor Daranyi, Nasrine Olson, Marina Riga, Efstratios Kontopoulos, and Ioannis Kompatsiaris; Presented by: Nasrine Olson]

A State of the Art Survey: Business Cases Based on Semantic Web Technologies in Healthcare [Authors: Vivi Ntrigkogia, Thanos G. Stavropoulos, Maro Vlachopoulou, and Ioannis Kompatsiaris; Presented by: Spyridon Symeonidis]

Knowledge-based Intelligence and Strategy Learning for Personalised Virtual Assistance in the Healthcare Domain [Authors: Eleni Kamateri, Georgios Meditskos, Spyridon Symeonidis, Stefanos Vrochidis, Ioannis Kompatsiaris, and Wolfgang Minker; Presented by: Spyridon Symeonidis]

The second of these papers, written by project members, presented the SUITCEYES

ontology and the way in which a set of static and dynamic haptograms are designed to represent concepts for use in the haptic communication interface which is being developed within SUITCEYES. This paper was regarded well and received the 2nd prize for best paper award.

The full text of these papers are published in the conference proceedings, and can be accessed freely here.

Smart Materials and Surfaces Conference 23-25 October 2019

Nils-Krister Persson and Eva Lindell (University of Borås) from SUITCEYES participated in the 5th ed. Smart Materials and Surfaces – SMS Conference 23-25 Oct 2019 in Lisbon, Portugal (https://www.setcor.org/conferences/SMS-2019). The conference had a global span and targeting research on novel smart materials, surfaces and structures.

Eva Lindell presented "Connecting the world to garments – capturing, filtering, defining, translating, mapping and actuating in, on and off the textile" E. Lindell, L. Guo, R. Holt, Z. Ling, E Kontopoulos, N-K. Persson. The presentation was given during the session on "smart sensors, smart textiles, wearables & Internet of things". Approximately 30-40 persons attended the session.

Key point of the presentation was the systematic perspective of SUITCEYES that implements complex functions integrated in a garment. The presentation touched upon the importance of working with different integration strategies, meaning how we integrate certain functions into a textile or a garment. This paper can be freely accessed from the conference proceedings here.

Future events

We look forward to seeing you at the 35th CSUN Assistive Technology Conference, March 9th-13th 2020 in Anaheim, USA.

Read more about this event »

About SUITCEYES

SUITCEYES is a three year long (2018-2020) research project that has received funding from the European Union's Horizon 2020 Research and Innovation Programme under grant agreement No 780841.
The consortium consist of: University of Borås (UB - project coordinator); Centre for Research & Technology Hellas (CERTH); Offenburg University of Applied Sciences (HSO); University of Leeds (UNIVLEEDS); Eindhoven University of Technology (TU/e); Les Doigts Qui Rêvent, Talant (LDQR); Harpo Sp. z o.o., Poznań (HARPO)

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