

Minutes of SP4LIFE Workshop #2

Belgrade, June 6 & 7, 2022

Participants:

From Slovakia: Dr. Milan Tysler, Dr. Daniel Gogola, Dr. Fedor Lehocki in person, Eduard Znava and Barbara Andrasikova virtually

From Belgium: Prof. Carlo Iorio, Christophe Minetti

From North Macedonia: Prof. Ana Madevska Bogdanova, Prof. Nevena Ackovska, Ass. Prof. Magdalena Kostoska, Ass. Prof. Bojana Koteska

From Serbia: Dr. Marko Spasenović, Teodora Vićentić, Stefan Ilić

The workshop started on June 6 and continued through June 7 (see the detailed program).

On Day 1, the workshop started with a tour of the laboratories of the host institute, the Institute of Chemistry, Technology and Metallurgy in Belgrade, Serbia. During the tour, the participants had the opportunity to see equipment purchased from project funds: laser engraver, source-measure unit, and microscope additions. The participants witnessed a demonstration of a working respiration sensor that was made during the project.

The first presentation was given by Dr. Tysler, who introduced the project and its main goals, milestones and deliverables. He pointed out the task and issues that has to be solved within the 3rd milestone. After the introduction, Dr. Gogola gave a presentation about the proposed architecture of the control electronics and selected ECG/PPG sensor for the wearable patch.

Dr. Spasenovic presented a summary of the progress of the graphene sensor development, after which Teodora Vicentic and Stefan Ilic presented details of the development of heartbeat and respiration sensors from graphene, their possible biocompatible packaging and the accompanying power and readout electronics.

Prof. Madevska-Bogdanova presented a summary of the algorithms that are used to analyse data from physiological signals. Prof. Nevena Ackovska, ass. prof. Magdalena Kostoska, and ass. prof. Bojana Koteska presented HeartPy numerical analysis of respiratory rate and heartbeat, and other methods based on big data for analysing SpO2 and blood pressure signals.

Dr. Lehocki presented the flowchart model of prof. Masar that describes the workflow of emergency services, focusing on points in the flowchart that could be affected by introducing wearable sensor patches. Eduard Znava and Barbara Andrasikova presented virtually from Slovakia, discussing their work on estimation of respiration rate from ECG signals.

Prof. Christophe Minetti presented a testing board with a controlling electronics and discussed possible HW solutions of the wearable patch, including version with NFC chip for power supply and communication.

The presentations were followed by discussion that continued until late afternoon and on Day 2. Several key points were addressed, and actions were planned:

- The electronics subgroup meetings will continue at a faster pace, at a rate of one meeting every 3 weeks. The meetings will be coordinated by prof. Minetti. The meetings will be held online, apart from one meeting which is to take place in person before the end of the year. The first task of the electronics subgroup is to define the specifications, the CPU and coding language. It was agreed

that variant with battery (proposed by IMS) and variant possibly without battery on the patch (proposed by VUB) will be considered.

- Prof. Madevska-Bogdanova suggested to attempt extraction of SpO₂ from the heartbeat signal measured with the graphene sensors.
- The graphene sensors are to be made more robust, to improve repeatability and stability.
- It was concluded that the heart rate and respiration rate are to be calculated by signal processing on the patch (using the ECG, PPG and breathing signals), while blood pressure and SpO₂ and possibly other parameters or markers can be computed from the wirelessly streamed signals on a computer in the emergency vehicle.
- Underspending will have to be corrected during this Milestone.
- PhD student & young researcher exchange and training need to be ramped up quickly now that travel restrictions have eased. Prof. Koteska will visit Belgrade for one week in July to participate in measurements with graphene sensors, learning about those measurements and transferring knowledge about data analysis.
- Students Vicentic and Ilic will schedule a visit to Brussels in the first half of October, to participate in training on wearable biocompatible materials, material testing, and electronics integration. The contact for scheduling their visit will be Immacolata Greco.
- Project meetings will also be intensified. The meetings will be quarterly, with next meetings to take place preliminary in Kotor, Montenegro (September 2022), Bratislava, Slovakia (December 2022), Ohrid, North Macedonia (April 2023), and Brussels, Belgium (June 2023). The meeting in Kotor will be followed by a PhD school and training component.
- Joint applications for follow-up funding were discussed. The EIC Pathfinder program was identified as potentially a good platform. The deadline for the Pathfinder is in October. An online meeting between the participants will be organized in the next 2-3 weeks by Dr. Tysler to discuss ideas for the call. Also, a more traditional Horizon platform will be considered for a joint application.

The minutes were taken by Marko Spasenović

vetted by Milan Tyšler