RK TECH

The Regulation of Circadian Rhythm in Clockwork Project

The Hungarian company, RK Tech Ltd. is participating in an AAL project, called Clockwork with other consortium partners involving researchers and sleep specialists from Portugal, Spain, Italy and Austria. RK Tech Ltd. has the role to develop sensors for measuring physiological, environmental parameters, and its efforts was supported and funded by the Hungarian National Research, Development and Innovation Office.

1. Figure
The official logo of Clockwork project
Source of figure: http://www.aal-europe.eu/projects/clockwork/

The ongoing Clockwork project aims to promote a healthy and comfortable environment for middle-aged to older shift workers by providing support in improving their circadian rhythms. Among the many different patterns of shift work, those including nightwork are the most disruptive for the circadian clock. Being exposed to different lighted environments during the day without considering the person's day-night rhythm, exposes them to the risk of disrupting their circadian rhythm and increasing the risk of suffering diseases such as cancer or cardiovascular diseases. For this reason, shift workers with sleeping issues are the main targets of Clockwork project.

The objective will be achieved through the enhancement of external synchronizers that will help older workers maintain a healthy and robust day and night rhythm by introducing small modifications in their public and private environment. Beside other factors, such as noise level or temperature, light conditions can be instrumental in adjusting the circadian rhythms of shift workers. Receiving the right light intensity and quality at the correct time can enable them to be more productive and remain healthy.

Three main tools will be used in the project: an activity monitoring device, a feedback and support application framework and an innovative environmental circadian empowering system module, which includes the design of a smartphone application, a lighting device, a wireless sensor box, a smart badge and actuators to regulate the environment. A web platform and a PC application will be also used by sleep specialists for displaying relevant data regarding on shift-workers' circadian rhythm to understand and fight against sleep disorder and other health hazards caused by unorthodox working schedules.

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Portuguese and Spanish partners are engaged in developing the background of the system: namely the server based on Firebase, the activity tracker smartphone, the lighting adjustable smart lamp and the wearable badge which will be measuring light intensity (LUX) and the movement of users. At the same time, RK Tech Ltd. is designing the prototype of the box with a spectrometer, a digital microphone, and a temperature sensor built in it for measuring environmental parameters: the light (LUM, LUX, CCT, CRI, x, y), the noise level (dB) and the ambient temperature (C°), while working on an evaluation software for Portugal sleep specialist. To provide more data, the sensor box can be optionally integrated with humidity and air pressure sensors, too.

As a part of its development processes, RK Tech Ltd. is also engaged in designing intelligent sensors for measuring physiological parameters. As a result, RK Tech Ltd. has developed the prototype of a PPG sensor which is going to be expaned with exra functions for detecting arrhythmia in users. For measuring oxygen saturation, a SPO2 sensor was also built which is another PPG method, but it uses red and IR LED instead of the previous green one.

By analyzing the collected data, the smartphone will be able to adjust the lamp for optimizing the conditions of the room where shift workers stay and give them advices how to impove their own health.

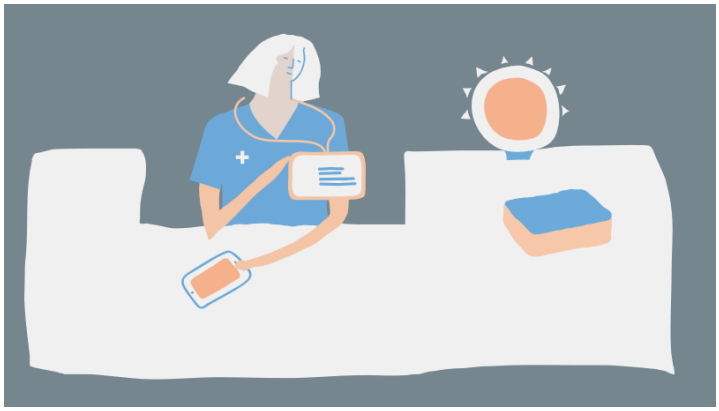

Figure 2. The main elements of the system
Source of picture: http://clockworkproject.eu/

The trials of the integrated Clockwork system with the sensors developed by RK Tech Ltd. will be carried out involving all consortium partners, and the final results of the project are going to be introduced in a scientific paper.

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