

HSS: Healthcare Sensors and Systems

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Abstract—Healthcare Sensors and Systems are part of the actual human daily life. Nowadays, we are able to find them practically everywhere, as integrated, among others, in our homes, body, mobile devices and vehicles, with the objective of improving our safety, comfort, performance and quality of life. This special session will focus on a system to improve the autonomy of blind people, a system for the detection of wake state of professional drivers and a medical device to classify the human blood type.

Keywords—blind people; professional drivers; blood types; computer vision; biometric parameters; medical devices

I. INTRODUCTION

The aim of the Healthcare Sensors and Systems (HSS) session is to bring together researchers, academics and professionals to contribute to the dissemination of HealthCare Sensors and Systems in the Engineering domain.

The recent advances on sensors, reduced energy electronic components, computer and communication technology has allowed the development of solutions and systems into the healthcare domain. The capability of accurate detection and alert of health conditions that require treatment or simply medical supervision is a major necessity. We are able to observe the development of a high number of solutions considering wearable or implantable sensors supported by micro and nanotechnology with the purpose of reducing the invasion in the users and increasing its easy acceptance. Moreover, common used daily objects are integrating also these sensors [1].

For this special session, we focused on the following topics related to healthcare sensors and systems: computer vision and machine learning as a tool to increase the autonomy of blind people regarding the clothing combination, as well as for the detection of human blood types and the quantification of biometric parameters in order to predict the sleep of professional drivers. We were very satisfied to receive submissions addressing different topics related to healthcare sensors and systems.

II. SUBMISSIONS

The first paper is presented by Vítor Carvalho and is entitled “My Eyes – Automatic combination system of clothing parts to blind people: prototype validation”. The aim of this work is to present a solution for the selection and

combination of clothing for the blind. Thus, this article describes the project developed, in agreement with the Portuguese Association of the Blind and Amblyopic of Portugal (ACAPO), in the creation of a web platform in aid of the combinations of clothing. The Near Field Communication (NFC) technology is the basis of this project in the identification of garments. The features of the garments are inserted manually, and may be combined and there is the possibility to automatically identify the color of the garment. The system has been tested by the ACAPO organization and the first impressions are promising, which are a good starting point for the future. With this solution, it will be possible to promote the inclusion and autonomy of blind people [1].

The second paper is presented by Joaquim Gonçalves and is entitled “Towards to a system for predict a insufficient wake sate in professional drivers”. The aim of this paper is to develop a system able to alert professional drivers of a sleep state. Sleep is one of the major responsible in road accidents, their early detection can prevent many of these types of accidents. The current sleep detection systems are based mainly on the evaluation of the behaviour of the driver expressed by the steering wheel movement, facial expression or eyes movement monitored by a camera, however, these systems to detect sleep when it already exists and this has proved insufficient. It is fundamental to anticipate this state more than to realize that the driver is in the state of drowsiness, alerting the driver while he is still awake for the necessity to stop and to rest. The current wearable devices have a set of sensors that allow the evaluation of biometric parameters as well as information about body movement that can help to predict sleep state [2].

The third paper is presented by Vítor Carvalho and is entitled “Development of a blood type analyzer using computer vision and machine learning techniques: a review”. The aim of this paper is to present a system able to detect human blood types in reduced time (less than 5 minutes) allowing its use in emergencies. Specially in urgency scenarios, when the available time for blood transfusions is scarce, the O- blood type is given (universal donor). Although, sometimes this can cause transfusion reactions that can lead to the death of the receiver. The equipment available on the market is not adequate for emergency scenarios (not portable and slow results). This paper presents the steps taken into consideration in the development of a blood type analyzer using computer vision and machine

learning algorithms suitable for emergency situations (small size, lightweight, easy transportation, ease of use, fast results, high reliability and low cost). Several prototypes have been developed being its final version performing real world scenario experiments in hospitals for validation. With this system, it will be possible to contribute to the reduction of casualties in blood transfusions associated to human error or blood incompatibilities [3].

III. CONCLUSION

The HSS special session includes a broad range of topics related to inclusion of blind people, detection of wake state of professional drivers and detection of human blood types. The technologies used in these solutions are based in computer vision, machine learning and biometric sensors. It contains both survey papers as well as pilot studies introducing interesting ideas for future work in this relevant research domain.

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