Third IEEE UK&I YP Postgrad STEM Research Symposium, 8th November 2021, Online

PHOTOVOLTAIC SYSTEMS DESIGN THAT SERVES THE HUMAN SENSES

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OVERVIEW

Solar cells are typically used for energy harvesting applications. Their versatility enables them to be used in a variety of applications that require power in the microwatt to gigawatt scale. These electronic devices are now finding their way in wearable applications. In addition to their energy harvesting uses, these electronic devices can also be used for sensing applications. Therefore, the aim of this poster presentation is to showcase the range of photovoltaic systems that can be used for wearable and portable applications with a view to serve our human senses. Examples of such wearable systems may include soft contact lenses, or a wearable bracelet device. In this article, we will demonstrate an example of smart contact lens design that utilizing photovoltaic (PV) cell for both energy harvesting and sensing.

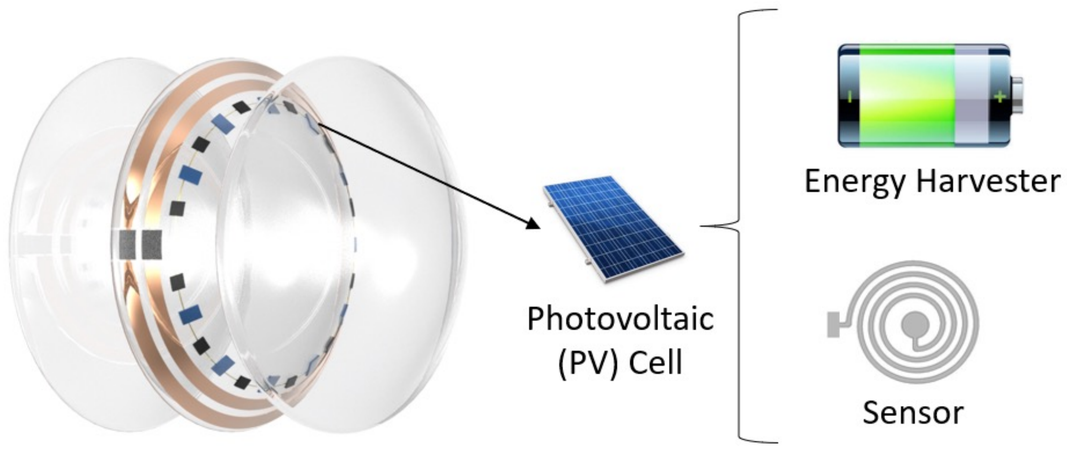

Fig. 1. A smart contact lens design that uses PV cells for both energy harvesting and sensing

METHODOLOGY

Solar cells are among the highest energy density harvesters available today. For outdoor applications, typical power conversion efficiencies (PCE) for vary between 10% and 25% [1]. According to previous design, researchers also investigated the possibility of integrating solar cell in wearable and implantable applications. We aim to integrate PV cells in smart contact lenses for both sensing and energy harvesting applications, as is shown in fig. 2.

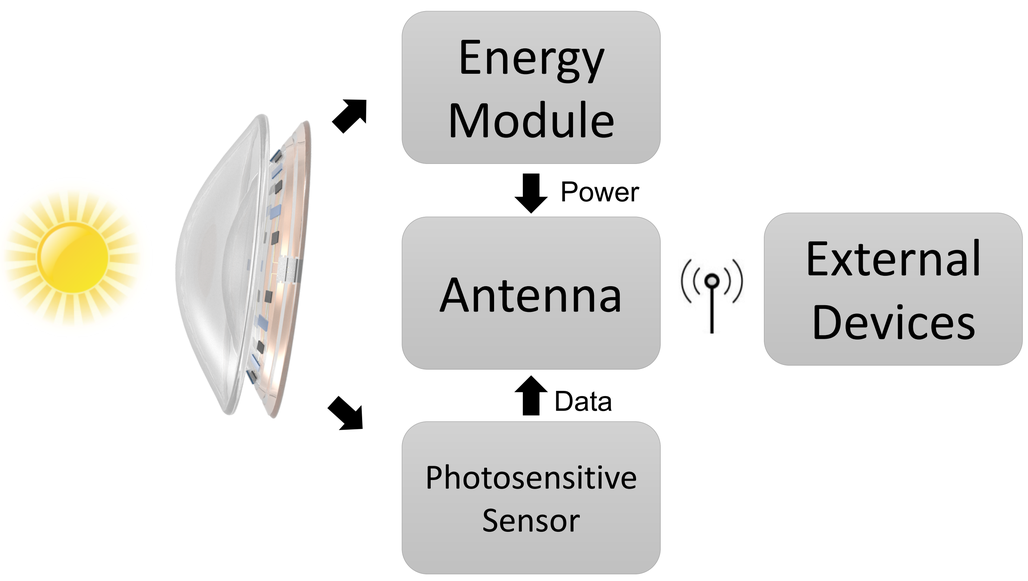

Fig. 2 A block diagram demonstrating how PV cells could be used for sensing and energy harvesting in smart contact lens design.

RESULT

Smart contact lenses [2] with PV cells could be used to detect eye blink. PV cells can sense these variations in light intensity. Similarly, the wearer can send instructions to external devices via conscious blinking. Thus, contact lenses with PV cells can be used to facilitate a range of human-machine interactions, as demonstrated from the concept in fig.3.

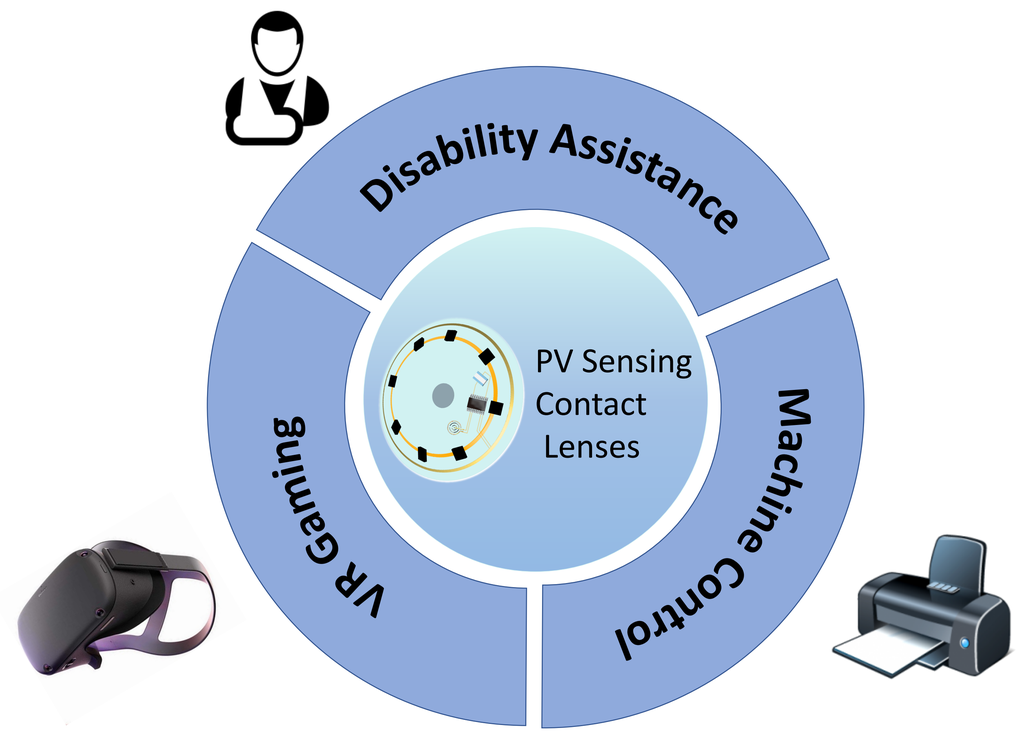

Fig. 3. Range of human-machine interaction (HMI) applications where PV cells in contact lenses could be used..

CONCLUSION AND FUTURE WORK

In conclusion, PV cells can be used to harvest energy and sense light intensity simultaneously. Smart contact lenses integrated with PV cells can facilitate the next generation of human machine interfacing devices. We aim to optimize the design of these PV cells [3,4] and validate our simulations work using lab fabricated devices.

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