Vision Lens for Visually Impaired People

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Abstract*: Total blindness is a term used to describe those who have complete lack of light perception, documented as no light perception (NLP). Only about 15% of people with eye disorders have total blindness, the majority of those with visual impairment have some level of vision. Low vision is a term used to describe those whose vision cannot be fully corrected by conventional method such as glasses, contact lenses, medicine, surgery, magnification aids or assistive technology. Visual impairment is a functional term to describe those whose decreased visual function interferes with the ability for one to perform their activities of daily living, such as reading, driving, and watching TV. People with visual impairment face various problems in their daily life as the modern assistive devices are often not meeting the consumer requirements in term of price and level of assistance. All the computing and processing operations were done using the Raspberry Pi 4. For the result, the combination of using OCR with EAST detector provide really high accuracy which showed the ability of the glasses to recognize almost 99% of the text. However, the glasses have some drawbacks such as: supporting only the English language and native language and the maximum distance of capturing the images is between 40-150 cm. As a future plan, it is possible to support many languages and enhance the design to make it smaller and more comfortable to wear.*

Keywords: Visually Impaired, Object Detection, OCR, Raspberry pi

I. INTRODUCTION

The number of visually impaired people is growing over the past decades. As reported by the world health organization (WHO), about 285 million people worldwide are estimated to be visually impaired. However, until now many schools and jobs cannot accommodate them mainly due to lack of assistive technologies and economic barriers. As a result, 90 % of them still live in low level of income. Even when the new aids or technologies become available, they are either too expensive ($3000 and above), or affordable ($200) but with single or limited task functions only. Among all assistive devices, wearable devices are found to be the most useful because they are hand free or require minimum use of hands. The most popular type is head mounted device. Their main advantage is that the device points naturally at the viewing direction, thus eliminates the need of additional direction instructions, unlike other devices. This paper presents a new design of smart glasses that can provide assistance in multiple tasks while maintaining at a low building cost. The design uses the new raspberry pi 2 single board computer, a camera, and an earpiece to convey information to the user. Due to page limit, we only demonstrate reading task only. The experiment results and how additional tasks may be added are discussed.

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