Wheelchair for Physically Disabled People with Voice & Eye Control

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Abstract

Proposed work basically depend on two systems 1). By Eye control: This is a method to guide and control the wheelchair for disabled people based on movement of eye. This concept can be used for people with loco-motor disabilities. The proposed system involves three stages: image detection, image processing and sending of control signals to wheelchair. The eye movement is detected using a head mounted camera. The corresponding output signals are then send to the motor driving circuit which will control the motor actions. 2). By Voice control: Electronic system configuration, a sensor system, a dependent-user recognition voice system has been planned in this wheelchair. In this way we have obtained a wheelchair which can be driven with using voice commands and with the possibility of avoiding obstacles and downstairs or hole detection. The wheelchair has also been developed to allow autonomous driving (for example, following walls). nical model, control (low level control, control by voice commands), voice recognition and autonomous control are considered.

Keywords- Eye Controlling Section, Voice Controlling Section, Obstacle Detector, Arm Controller, IR Pair, Eye Sensor, Voice Recognition Unit

I. INTRODUCTION

This project delivers a method to guide and control the wheelchair for disabled people based on movement of eye and voice. This concept can be used for people with loco-motor disabilities. The proposed system involves three sections: Eye controlling section, voice reorganization unit and Obstacle detector. Wheelchairs are used by people for whom walking is difficult or impossible due to illness, injury, or disability. People who have difficulty sitting and walking often need to use a wheel bench. A basic manual wheelchair incorporates a seat, foot rests and four wheels: two, caster wheels at the front and two large wheels at the back. Other varieties of wheelchair are often variations on this basic design, but can be highly customised for the user's needs. Such customisations may encompass the seat dimensions, height, seat angle footrests, leg rests, front caster outriggers, adjustable backrests and controls. An electric-powered wheelchair is a wheelchair that is moved via the means of an electric motor and navigational controls, usually a small joystick mounted on the armrest, rather than manual power. For users who cannot manage a manual joystick, head switches, chin-operated joysticks, sip-and-puff or other specialist controls may allow independent operation of the wheelchair.

A. Need of Project

People who have difficulty sitting and walking often need to use a wheel bench. A basic manual wheelchair incorporates a seat, foot rests and four wheels: two, caster wheels at the front and two large wheels at the back. Other varieties of wheelchair are often variations on this basic design, but can be highly customised for theuser's needs. Such customisations may encompass the seat dimensions, height, seat angle (also called seat dump or squeeze), footrests, leg rests, front caster outriggers, adjustable backrests and controls.

B. Project Includes

1) Voice recognition section
2) Eye controlling section
3) Obstacles detection section

C. Relevance of Work

1) Karthikeyan K C - Proposes an optical-type eye tracking system to control powered wheel chair.
2) Libor Masek - Reduces complexity significantly by scaling down all images to a constant image size to speed up the whole process.
3) Daugman -Proposes an integrodifferential operator to find both the pupil and the iris contour.

II. LITERATURE SURVEY

Karthikeyan K C et.al, proposes an optical-type eye tracking system to control powered wheel chair Users eye movement are translated to screen position using the optical type eye tracking system movement. The method allows the user to look around freely while the wheelchair navigates automatically. The existing EBEWC is controlled by human eyes only. Therefore, disabled person can control the EBEWC by themselves. Most of the computer input system with human eyes only consider in specific condition and does not work in a real time basis. Moreover, it is not robust against various user races, illumination conditions, EWC vibration, and user's movement. Moreover, it is confirmed that the existing EBEWC can be controlled by human eyes only accurately and safely. In another existing work the wheel chair is moved by using EOG signal A simple bio potential amplifier was used for signal detection and C programming for data acquisition and display for its flexibility, which was a technique proposed for EOG cursor control

The implemented system involves voice recognition unit, digital data processing unit with DC switching section. The existing system consists of a microcontroller and a voice recognition processor that can recognize a limited number of voice patterns. This is voice based guidance system, which uses the special voice recognition IC HM2007 for speech enhancement. It also generates different desired signals according to the spoken words which further used to control the movement of robot. The microcontroller used is PIC16F877A, to give the instructions to the robot for its operation. Backup power is included in this research to retain the voice commands while the system is powered off. The R.F transmitter and receiver are used here, for the wireless transmission purpose. The constructed system can be commanded in the voice of English as well as Myanmar.

III. PROPOSED METHODOLOGY

A. Problem Definition

The problem of proposed EBEWC system is the robustness against different user types, illumination changes, user's movement, vibration, and accuracy. In order to consider these as vehicle system, if the user changes, the system should be works without any input parameter changes. In accordance with EWC movement, illumination condition may change. Also, disturbances due to EWC vibration is potentially problem. In the conventional EWC control system with human eyes only, camera is mounted on EWC. This may cause a vulnerable when EWC is vibrated. Also, when user moves their head, gaze estimation is difficult. Furthermore, illumination condition may change during EWC movement. The proposed EBEWC system utilizes IR camera which mounted on user's glass. This way will eliminate problems of illumination changes, user's movement, and EWC vibration. Furthermore, the pupil detection based on pupil knowledge will improve the robustness against different users. the accuracy of the voice recognition circuit is less when assign the commands in the noisy area. Moreover, a malfunction of the system is occasionally found for the two similar command words “forward” and “backward”. It is because these two words have the similarity which is the “ward” words.

B. Methodology

Table 1: Table of Methodology

METHOD	*ADVANTAGES*
Bio-potential based method.	*Potential Difference can be calculated easily in both light and dark Environments.*
Voice Based Methods	*Increases Productivity* *Can help people who have trouble using their hands Can help people who have cognitive disabilities*
Motion Based Methods	*A motion based wheelchair can have the option to allow for more physical support, including adjustable seating such as tilt and recline. Motion based wheelchair users can also adjust the height of the chair to see their environment more clearly*

Table 2: Table of Methodology

Method	*Drawbacks*
Bio-potential based method.	*Poor gaze direction accuracy compared to video tracker, relatively costly*
Voice Based Methods	*Less accurate on:* – *Background Noise* – *Speaking style* – *Sex of the speaker* – *Speed of the speech*
Motion Based Methods	*Uses human effort to navigate like joystick.*

IV. SOFTWARE IMPLEMENTATION

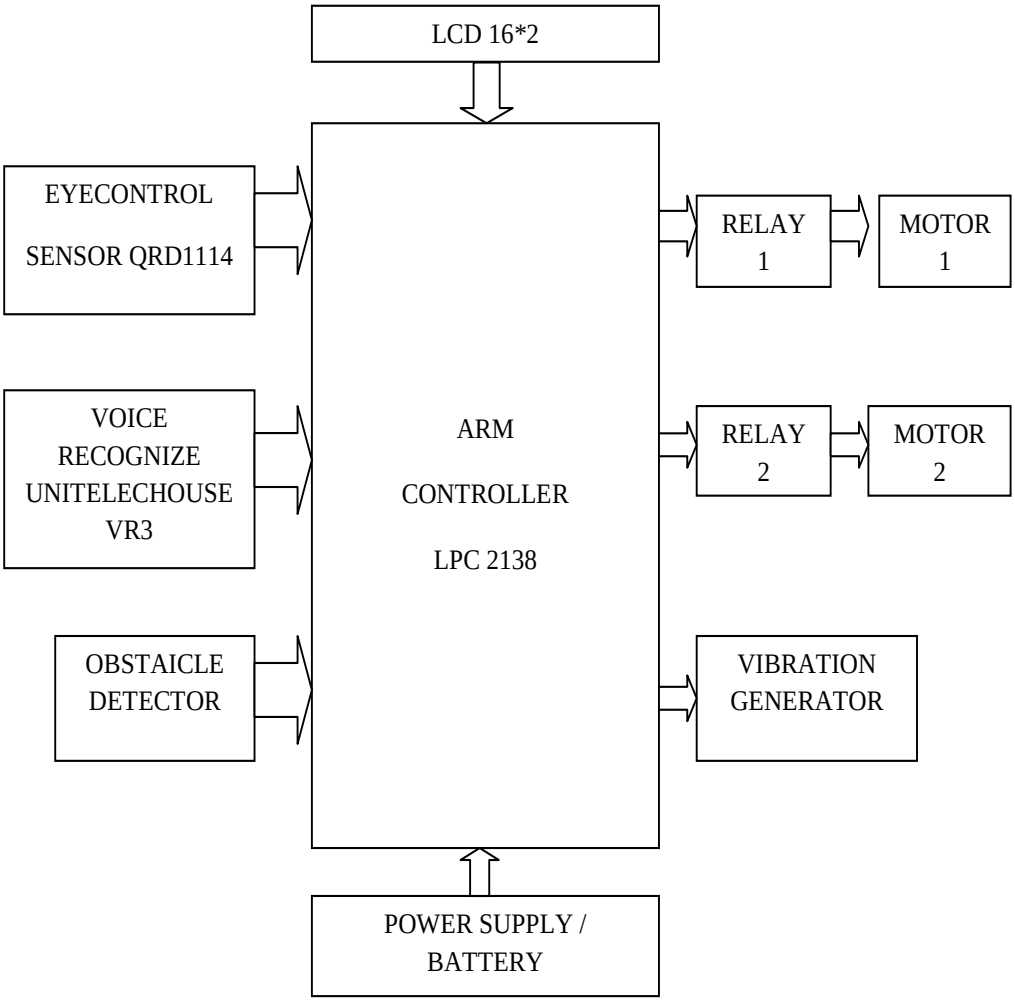
A. KEIL Software

KEIL was founded in 1986 to market add-on products for the development tools provided by many of the silicon vendors. Keil implemented the first C compiler designed from the ground-up specifically for the 8051 microcontroller. Keil provides a broad range of development tools like ANSI C compiler, macro assemblers, debuggers and simulators, linkers, IDE, library managers, real-time operating systems and evaluation boards for 8051, 251, ARM, and XC16x/C16x/ST10 families. In October 2005, Keil (KeilElektronik GmbH in Munich, Germany, and Keil Software, Inc. in Plano, Texas) was acquired by ARM. The Keil Compilers support all 8051, 251, C16x/ST10, and ARM compatible devices

B. Proteus Software

Proteus is a software technology that allows creating clinical executable decision support guidelines with little effort. Indeed, it should be fun creating your own guidelines. Once a guideline for a condition has been created, it can be executed to provide stepwise advice for any patient having that condition. This site is dedicated to the Proteus executable guidelines model, tools based on the Proteus approach and the automated guidelines created using those tools

V. BLOCK DIAGRAM



VI. DESIGN AND IMPLEMENTATION

Fig. 1: Eye Controlling Section

Fig. 2: Voice Controlling Section

Fig. 3: Final Assembly

VII. FUTURE WORK

The wheelchair for Physically Disabled Persons designed in this project has a lot of advantages, but can also be improved on. Here the vehicle is controlled by three ways, eye movement, voice recognition and obstacle detector. This is a better option for the patients who cannot adopt methods which are already mentioned. Another proposed method is the controlling of the vehicle by the control of mind. By this a person can control the motion of the same by just thinking itself. This vehicle can be modelled in such a way that it can be easily turned into a semi sleeper mode in order for the patient to feel more comfortable and thereby reduce the continuous one mode sitting problem. Image Processing also can be used instead of embedded system. In designed wheelchair voice commands used is in English language only but in future work we can use commands in multiple languages.

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