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Approaching Vehicle Identification for the Visually Challenged

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Abstract – **The paper presents the development of a novel information system for the visually impaired. The objective of the developed system is to enable the visually impaired people to get information of the incoming source of vehicle without any other physical help and to travel by vehicle such as buses to their desired destinations. This device works in such a way, where the visually impaired people are able to detect the arrival of a particular vehicle as their only source of transportation. The system incorporated is designed to be simple and portable hand held for the convenient usage. A simple wireless communication system with frequency modulation is employed for the signal transmission. The microcontroller in the system is used to generate the automatic signal that is transmitted through the FM transmitter. The signal picked up by a single chip FM receiver and announces voice message of the coming vehicle information using the voice record and playback device. In this way the visually impaired will manage to catch the vehicle by their own ability. However the model developed aims for identify only one vehicle but can be extended to any number of systems. The FM carrier frequency used for communication between the transmitter and receiver is 89.3MHz. The maximum transmission distance for transceivers signal is roughly about 0.5 to 1 meter.**

Keywords: **Embedded Controller, Visually impaired, Information systems**

I. Introduction

Visually challenged is a person who is partially sighted or incapable of sight which makes them impossible to see around and observe the surrounding environment by using adaptions such as touching [1]. Dependence of the very next person is inevitable in any particular day activity. Many commercial products have been developed to sustain the disabilities substantially thereby improve their quality of life. The use of these devices allows the user to experience the freedom of certain aspects of life such as mobility, communication and other important fundamental tasks. Normally the visually challenged persons find difficulty in their mobility to reach their destination. Most of them fall under the lower income group and mostly depend on the public transport [2][3]. The most preferable public transport of common man is bus as it is cheap and economical. The process of catching a bus involves the combined skills of hearing, sight and cognition. The task will become nearly impossible for those visually challenged persons without the assistance of another person. The developed system provides a solution for this problem having the freedom to independently commute via public bus transportation. The developed system is tested with a single unit under real time condition.

II. System Description

The system is a portable handheld device that decodes the radio frequency (RF) signal from the transmitter attached in the bus and playback the route number of the arriving bus. The transmitter works automatically in sending signals by adding a microcontroller that generate information signals, which encodes and modulate by the transmitter to transmit the information signal at all the time. The receiver is a hand-held device for the visually challenged that receives and decodes the transmitted signal from the public bus. The voice playback system is activated for replaying the information of the bus which stored in it through speaker or

earphone. This system consist of TDA7000 single chip FM receiver, signal activate relay switch, and voice playback system. Figure 1 shows the block diagram of the system.

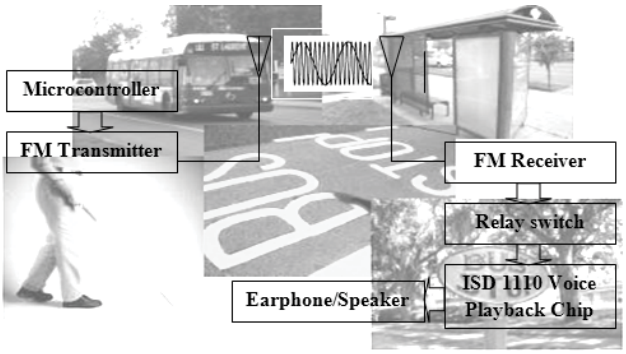

Fig. 1 Block Diagram of the System

The PIC16F84A microcontroller device generate the signal that is encoded and modulated with carrier frequency by the FM transmitter and transmit to a small, hand held, wireless receiver which carried by the visually challenged. The signal will be received by the FM receiver which tuned as same as carrier frequency of the FM transmitter. The FM receiver decode and demodulate the signal from carrier frequency and the demodulated signal (information signal) activate the relay switch and the ISD 1110 announce the information which stored in the ISD 1110 voice record and playback chip through the speaker or earphone. This enables visually challenged persons to identify, catch and board the bus with the same ease, convenience and safety of the average commuter. The software code designed for PIC16F84A is according to the Voice playback duration.

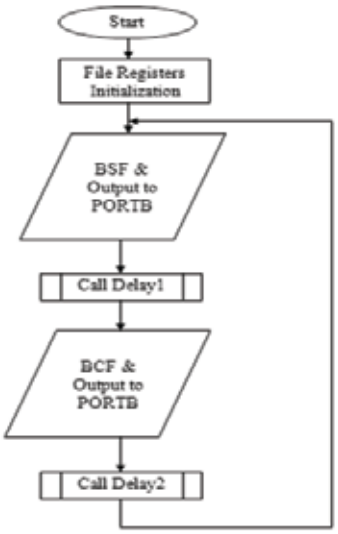

Fig. 2 Software System Flow Chart

For the playback of the information as audio, the software code for the controller is programmed to generate signals for every twelve seconds including a two second time delay for reset. The software programming follows the system flow-chart as in Figure 2.

III. Design Implementation

A. FM Transmitter

The variable LC tank circuit vibrates at frequencies in the FM radio band (88 to 108 MHz). The voice is modulated to transmit at a frequency between 88 and 108MHz by tuning the variable capacitor value. The variable capacitor and self-made inductor constitute a parallel LC circuit that vibrates at a resonant frequency to be picked up by the pocket FM radio. The transmitter operating carrier frequency is shown in Figure 4.

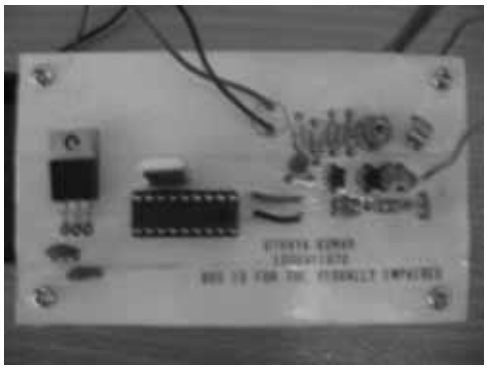

Fig. 3 Transmitter Device

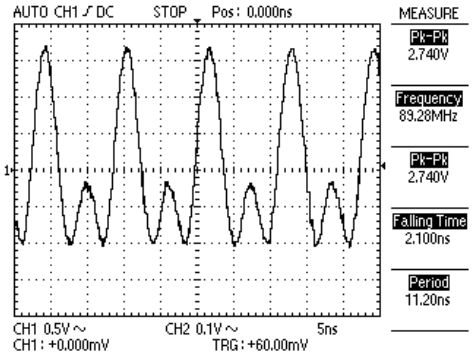

Fig. 4 FM Transmitter at 89.28MHz

B. FM Receiver

The TDA7000 chip is a FM receiver on a chip that receives frequency from 70 up to 120MHz. With this small receiver it is possible to pickup 88-108 MHz FM band. The demodulated receiver signal carrier frequency is shown in Figure 6.

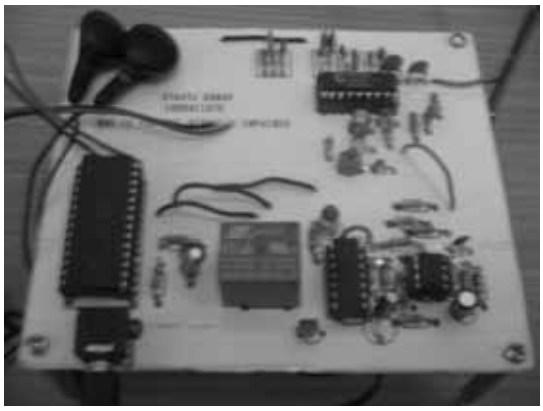

Fig. 5 Receiver Device

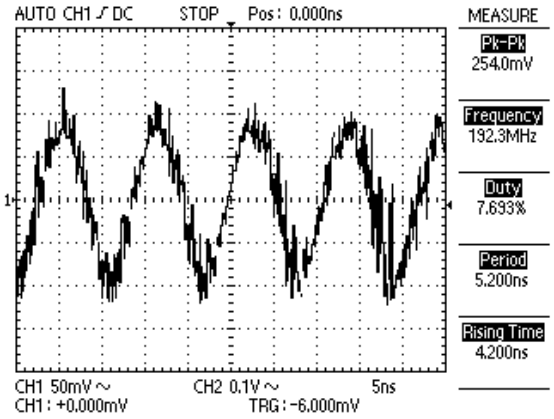

Fig. 6 Demodulated signal waveform

C. Signal Activated Relay Switch

The signal activated relay switch allows controlling the ON & OFF of any electrical appliances by analog signal such as tone and is specially designed to filter out ambient noise and respond only analog signal sound. The analog signal sensed and then amplified to activate the relay to ON & OFF.

D. Information Storage Device

The ISD1110 is the voice record/playback device used for information storage providing high quality, single-chip record/playback solutions to 10 second messaging applications. The CMOS device includes an on-chip oscillator, microphone preamplifier, automatic gain control, anti-aliasing filter, smoothing filter and speaker amplifier. Recordings are stored in on-chip nonvolatile memory cells, providing zero-power message storage. This unique, single-chip solution is made possible through ISD's patented multilevel storage technology. Voice and audio signals are stored directly into memory in their natural form, providing a high-quality, and a solid-state voice reproduction.

IV. Conclusion

A novel embedded controlled handheld device for the visually challenged person is developed. Communication between the incoming vehicle and visually challenged could be established through the use of FM transmitter and receiver device. The developed system is tested with the bus as the most common public transport. The automatic signal generation through PIC16F84A microcontroller chip established the signal generating process. The developed FM transmitter modulates the signal with produced carrier frequency at 89.28MHz. The FM receiver picks the signal to demodulate and activate the voice record and playback system device to playback the pre-recorded stored information with the support of signal activate relay switch to turn ON and OFF. This designed and developed system able to identify a bus ID for visually challenged. The carrier frequency which used for transmission is 89.3MHz, the unoccupied FM channel which identified by trimming the FM radio for empty carrier frequency. The possible distance for FM wireless communication of the system between the transmitter and receiver is about 0.5 to 1 meter long. However the developed system for a single approaching vehicle and further scope is in the development of information system for many incoming vehicles.

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