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Approach Towards Voice Control Smart Lift System for Physically Disable Person Using FPGA

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Abstract

In every high-rise building lift has become an important part. Generally, all lifts are operated using switches. For physically challenged person or blind reach, their floor without aid is quite difficult.Speech is the main medium for human communication. The project represents the voice operated intelligent lift. This follows the principle of speech recognition. Lift is controlled by the user's voice commands and useful for paralyzed, blind and physically challenged people. Lift operates based on the input voice commands, eliminates the use of buttons in the lift, and is user friendly. The project behaves like the human-machine interaction system and will be highly beneficial for the society. When user gives a command then voice recognition is done using Voice module and IR (infrared) sensor is used for detecting the floors, also stopping the motor rotation. The DC motor is used for controlling lift upward and downward motion. The voice-controlled lift is an implementation of FSM model in VHDL. The controller or the heart of this project is FPGA (Spartan 3a).

Keyword-*FPGA, PIR Sensor, IR Sensor,WIFI Module, Voice Module*

I. INTRODUCTION

In controller implementation for a lift system, several factors such as nature of the system, power consumption and reliability play vital roles in design considerations. Today, PLCs are commonly used in control and automation industry where easy programming environment is highly expected. However, for a complex response system, Field Programmable Gate Arrays (FPGAs) can be recommended due to their inherently parallel processing capability. An elevator (or lift) is a mechanical system to transport human beings or goods between floors of a building, vessel or other structures. Since, mostly it is an arrangement that effectively moves people, safety and the convenience of the travelling people should be certified. Therefore, implementation of proper control systems for elevators is necessary. A voice control elevator can be considered as a complex reactive system, which requires parallel event processing with large number of inputs and outputs. Therefore, FPGAs make a better solution for implementing a voice control elevator controller with added pros of reconfigurable, less power consumption, low response times and flexibility in expansion of designs. In this research, our approach was that developing an elevator algorithm for the voice control elevator with any number of floors and improving its reliability.There VHDL Was used due to its syntactical familiarity. VHDL is a hardware description language which is commonly used to describe digital circuits in a textual manner in designing. For coding, simulation and synthesis purposes QUARTUS prime and MODELSIM software was used. The final design was programmed to an FPGA which acts as the core of the controller and tested on real hardware.

II. LITRETURE SURVEY

Voice recognition module used for processing command to operate elevator.Elevator fully control using voice command.DevelopedMethodology for desired output. Microcontroller is used so required

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high response time.Implementation is difficult due to require more step [7].FPGA has played critical role in this system with it parallel processing.Use Verilog language for code using Xilinx ISE.Any number of floor input can easily handle. Introduce flexibility in expansion. Difficult to design complex code using Verilog [8].

III. PROPOSED SYSTEM

Our proposed system makes an easy way to use the elevator especially for the blind people. Provided by the remote in which will give the blind person a fully control over the elevator. The remote have an auto poweroff feature to turn off the remote after a certain time to conserve battery. A voice message to inform the user the battery is on low level to charge it. Also, there will be a voice confirmation for the selected floor and when the elevator arrives to it, and when the elevator`s door is opening or closing. In the elevator a relay is used to switch to some emergency rechargeable batteries when the power shuts down. The proposed system is not expensive since the remote contains the microphone and the loudspeaker together instead of putting them in two different levels. Also, the whole system works offline (i.e. no internet needed). The proposed system consists of two main parts as shown in Fig. 1. the initial part is a remote unit which will be with the blind user. The remote system, as shown in Fig., includes a FPGA to control and execute the voice orders of the speech recognition module (Speak2click) and send it to the transceiver and the text to speech module to make voice confirmations. The second part is the elevator unit in which includes, as shown in Fig. a transceiver to receive the orders and deliver to the FPGA to control the elevator movement. The IR sensor are used in each floor to guide the blind to be in front of the elevator`s door.

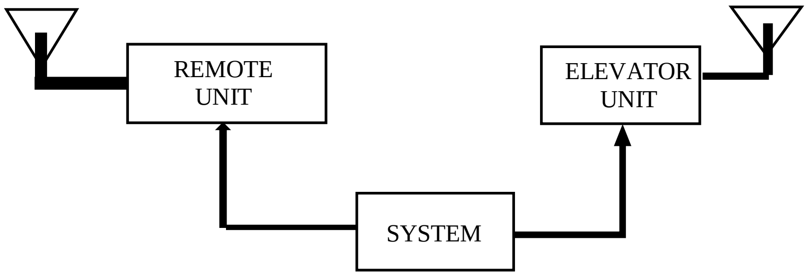

Fig. 1: Proposed System Methodology.

In shown in figure 2, the remote block diagram consists of Speech recognition module that provides interfacing between user and elevator by taking orders from user and recognizes them and translates these words to format that the FPGA can understand to execute them. FPGA Takes the orders from the speech recognition module and sends it to the transceiver to control the elevator and receive data from transceiver and send it to the text-to speech for confirmation. Transceiver module it works both transmitter and receiver and it transmits data wirelessly to the transceiver in the elevator to take action and receive the response of the elevator and send it to the FPGA.Text to speech module it is used for voice confirmation to the user by taking the elevator response into spoken words, it mainly takes the text from the FPGA and narrates it in audible words.

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IV. SYSTEM BLOCK DIAGRAM

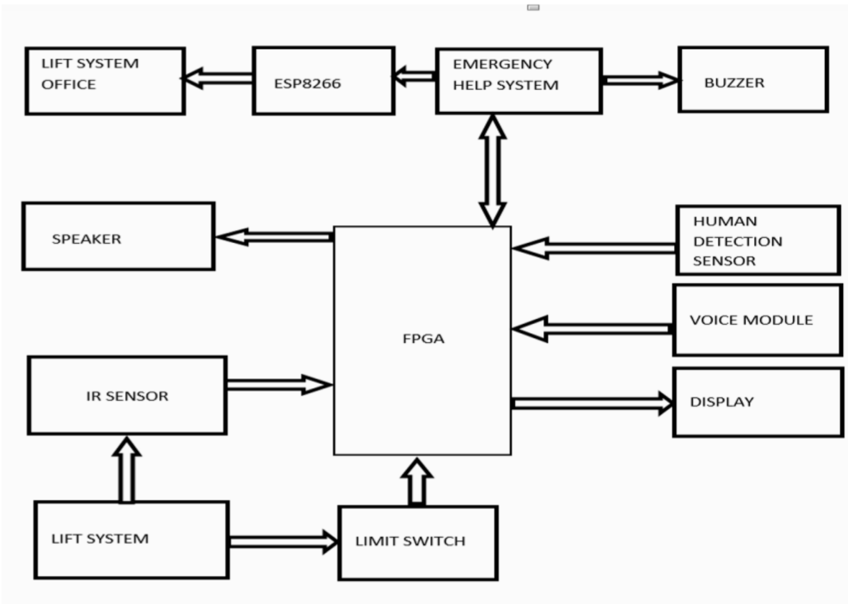

Fig. 2: Block Diagram of proposed system

In shown in fig. 2, the elevator block diagram consists of Transceiver It transmits and receives data wirelessly from the other transceiver in the remote control and send it to the microcontroller in the elevator to control the elevator and when the elevator response it sends the response to the other transceiver in the remote. FPGA that Takes data from the transceiver to control the elevator movement. Power source it is source of energy and provides the elevator with power.

V. SYSTEM FLOWCHART

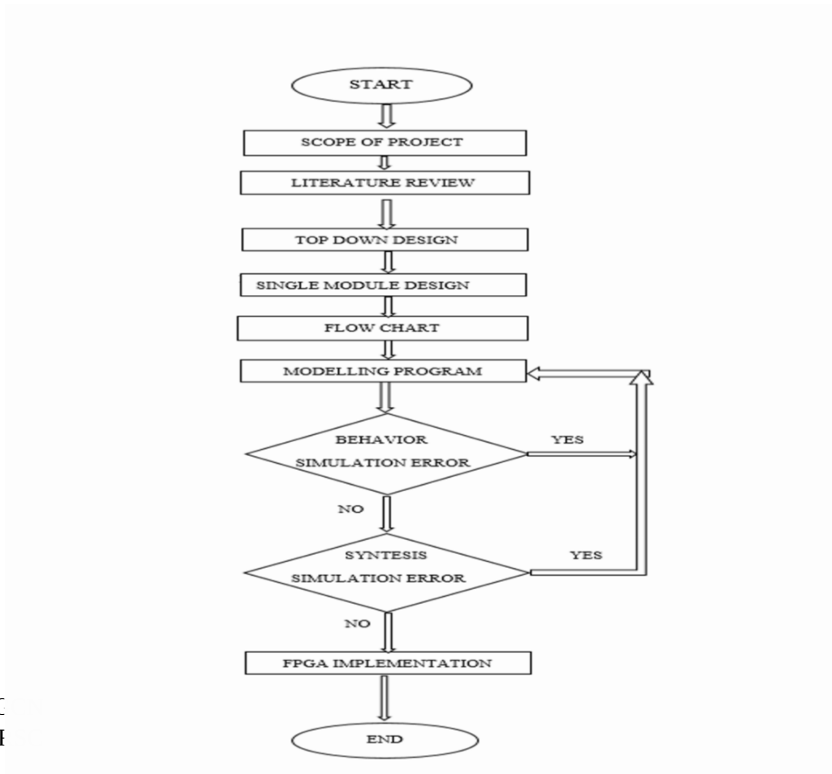

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Fig. 3: Proposed system flowchart.

Flowchart Description:

This is methodology of our project for reliable and efficient working of lift system. The first step was finding the scope of project on basis of survey of different paper and journal book and then we finalize the component according to requirement of our project.

The Heart of project which used for processing and recognition if FPGA. The blind persons stands in front of the lift the PIR sensor senses the person. The IR sensor is used for floor detection as well as to determine state of door.We have used ESP8266 module which is interface for emergency purpose with lift system main office.

System Components

- FPGA (Spartan 3a).
- PIR sensor.
- IR sensor.
- ESP8266.
- Voice module.
- Loudspeaker

VI. SYSTEM DESCRIPTION

By using the voice recognition module, which is the speakup2 click, we have been able to eliminate the use of the keypad. Since the voice recognition module transform the spoken words into orders that the microprocessor or microprocessor could comprehend. As for an example if the blind user said "3" the voice recognition module will transform that spoken word into "3" which is a trigger in the code of the proposed system, then the microprocessor will send the word "3" through the RF transceivers, which are two CC2530, to the other microprocessor in the elevator unit which will send a input to the stepper motor to 3x10,000 micro step, since each floor or level in the proposed system prototype is 10,000 micro step.

Although FPGA technology mapping has been a subject of extensive research, recent studies indicate that there is considerable room to improve. This is especially true in the complex solution space of logic optimization and technology mapping. There were some initial efforts in integrating logic optimization with mapping.

However, more research is needed to find effective and efficient ways to combine the two to arrive at better mapping solutions. As semiconductor advance, new FPGA architecture features are being introduced to improve area utilization, performance, and/or power. For example, architectures have been introduced or proposed to use LUTs with more number of inputs or multiple supply voltages. New mapping techniques are needed to use these new architecture features.

Physical synthesis for FPGAs needs to consider the impact on routing and rout ability. Most techniques stay at the placement level and pay little attention to routing. As a conclusion, for high utilization situations (common in practice), the predicted performance gain may not be realizable after routing. Future generation interconnect-centric physical synthesis techniques are needed to further improve predictability of results.

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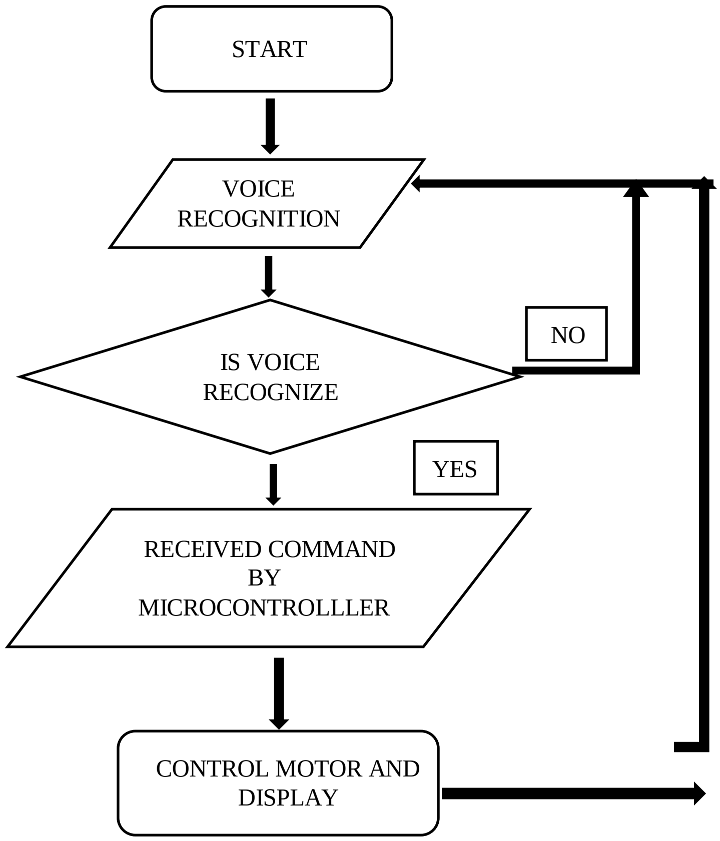

Fig. 4 Voice Recognition Flow

System Parameters	An Attentive Elevator Using Speech	Voice Operated Intelligent Lift	Smart Lift Voice Controlled Elevator	Voice Initialized Elevator	Proposed System
Blind enabled	No	No	Yes	Yes	Yes
Speech recognition efficiency	High	Medium	Low	High	High
Voice configuration for the blind	No	No	Yes	No	Yes
Power consumption	Medium	Low	Medium	Low	Low
Keypad	No	No	Yes	No	Yes
System complexity	Simple	Complex	Medium	Medium	Simple
Cost(in dollars)	120	80	190	172.5	153.53

Table I. COMPARISION BETWEEN SYSTEMS AND PARAMETERS

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VII. FUTURE SCOPE

- If number of floors increases the system can be implemented easily.
- Blind people can access it easily.

VIII. CONCLUSION

We focused on implementation and verification of a controller for the voice control elevator with basic functions in a reconfigurable structure and proposing a methodology to improve the reliability of the controller. The verification process, which was carried out on a FPGA to a prototype elevator with three, floors revealed modifications and developments to be done in later researches. For the improvements in hardware, circuits and speech recognition needed to be given special attention. In addition, further research can be done on designing the elevator algorithm for more functions with increased efficiency and desirable aspects. If an error occurred in two instances at the same time, the output would be an erroneous one. In addition, if the system failed to give an accurate input (e.g. sensor failure) the reliability of the elevator controller system is disturbed. Thus, this research creates many fresh ideas in a broad area to develop and modify a reliable FPGA based reconfigurable elevator controller.

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