IMPLEMENTATION OF HAPTICS ENGINEERING IN ATM FOR PHYSICALLY CHALLENGED

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INTRODUCTION
A survey was carried out to isolate the prime obstacles that exist for the disabled users in accessing the ATM. 72 disabled people were surveyed in which 73% answered that they will access the ATM with the help of their friends and relatives. The other 17% found that it is impossible to access the ATM. The reasons given by them were the Use of too many technical jargons, the unnatural interaction process and the lack of assistive hardware for them (Ayse Kucukyilmaz et al., 2011). So to overcome all these problems we go in for the implementation of haptics in ATM.

Haptics is a natural way for humans to communicate with computers in a collaborative virtual environment. Human computer collaboration is typically achieved by sharing control of the task between a human and a computer operator (Kristina Hook, 2008). When a single touch panel is used, it can replace many mechanical buttons, switches, knobs and provide increased communication with the user. So that the design cost and complexity can be reduced.

SYSTEM ARCHITECTURE
The sensor which is present in the ATM door decides whether the person is physically

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challenged or not and it changes its mode depending upon the decision (Feygin et al., 2002). The MEMS which is carried by the physically challenged person is used to convey the intentions through gestures, by assigning commands. Now depending on the gestures the person can easily access the ATM (Basdogan et al., 2000).

Transmitter Section

Figure 1 depicts the transmitter section. The RF ID tag which is provided to the physically challenged people is detected by the RF ID reader whose data are sent to the embedded controller (PIC16F877A) the gesture commands from the MEMS are also received by the PIC. The 230 V power supply is stepped down to 5 V by sending it through the bridge rectifier which removes the ripples and then to the low pass filter which removes unwanted noise and then to the voltage regulator which is used for sending out the regulated voltage which finally reaches the PIC. The output taken from the output port is then sent to the encoder, it is encoded and then to the modulator and finally, it reaches the RF transmitter and transmitted at the frequency of 433.92 MHz.

Receiver Section

Figure 2 shows the receiver section. The received signal at 433.92 MHz is sent to the RF receiver and the pulse width is demodulated and then it is decoded, and finally sent to the PIC. In order to interconnect this signal to the system or computer we use the RS232 level connector and connect it to the computer which is called as the GUI (Graphical User Interface). So, by this way the signals are transmitted.

IMPLEMENTING HAPTICS ENGINEERING IN ATM

This section describes in detail about the parts which are needed in order to implement haptics engineering in ATM. For various operations like switching controlling and monitoring the devices
a controller is needed (Evrard and Kheddar, 2009). In this paper we preferred an embedded controller.

**Embedded Controller**

The embedded controller is preferred because of its software and industrial advantages in power electronics like built in ADC, DAC, ROM, RAM, USART. This leads to lesser space occupation by the circuit and also the speed of embedded controllers are more compared to other processors. The embedded controller which is chosen here is PIC16F877A due to its various features. Peripheral Interface Controller (PIC) is enhanced version of microcontrollers. It has a high-performance RISC (Reduced Instruction Set Controller) CPU. Only 35 single word instructions are present. All are single cycle instructions except for program branches which are two cycle. It has 4K x 14 words of Program Memory (EPROM), 256 x 8 bytes of Data Memory (RAM), Interrupt capability (up to 14 internal/external interrupt sources), Eight level deep hardware stack, 12-bit multi-channel Analog-to-Digital converter, Universal Synchronous Asynchronous (USART) Receiver and USART Transmitter, it supports high and low speed applications.

**MEMS**

The term Micro-Electro-Mechanical Systems (MEMS) was first started being used in the 1980’s. It is primarily used in the United States and is applied to a wide set of technologies. The goal of MEMS is miniaturizing systems through the integration of functions into small packages. MEMS are the integration of element on a common silicon substrate through fabrication technology. The fabrication method is shown in the Figure 3. The elements may be mechanical elements, actuators, sensors, etc. The most used fabrication technologies include LIGA Bulk Micro Machining, Surface Micro Machining. MEMS are preferred due to their small size, Light weight, Ruggedness and Low power consumption.

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MEMS are the one which can act as transducers or as sensors act as transducers or also as sensors. MEMS can also actuate mechanical devices like switches, mirrors, etc. Transducer is a device or system that converts one form of energy to another form.

**RFID Tags**

RFID stands for radio frequency identification here the RFID is used as an ATM card. Figure 4 shows the basic tag assembly. There are three types of RFID tags one is the Passive tag that uses the reader field as a source of energy for the chip and for Communication from and to the reader. The power which is available from the reader field, reduces very rapidly with distance and is also controlled by strict regulations. This results in a restriction in the communication distance of 4-5 m when the UHF frequency Band is used which is of the range 860 MHz – 930 MHz. Semi-Passive tags which are also called as the battery assisted backscatter tags have built in batteries. This implies that they do not require energy from the reader field to power the chip. This is an advantage, because this allows them to function with lower signal power levels, which results in a greater distances of up to 100 m. Active tags are battery-powered devices that have an active transmitter. Unlike passive tags, active tags generate RF energy and apply it to the antenna. The coverage distance is more, but it is more costlier compared to the other two. Here we are using a passive tag to function as the ATM card.

**RESULTS AND DISCUSSION**

In this paper we discussed about the implementation of HAPTICS ENGINEERING in ATM which helps the paralytic patients to access it very easily. Here the physically challenged person is provided with the RFID tag which can act as ATM card as well. So, when this person’s card is detected the relay is switched on the motor works and the door opens and then the person gets inside and now using the MEMS the physically challenged person does his gestures which are received by the receiver in the ATM machine and accordingly the selections are made and needed amount is received. So by this way the physically challenged person can access the ATM very easily.

**GUI OUTPUT**

Figure 5 shows the snap shot of the screen which appears before the RF ID tag is detected. Which will be the screen for the normal person. Figure 6 shows the snap shot of the screen after the MEMS has been detected. Figure 7 shows the snapshot of the virtual keypad which is used by the
CONCLUSION

If this model has been implemented in ATM then the physically challenged people can easily access the ATM solely without anyone’s help. This will improve their standard and their confidence. So, we as engineers wanted to cater to the need of the physically challenged people, so we came up with this model.

REFERENCES


