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## RESEARCH ARTICLE

# EXCHANGE OF DEVICE USING HOT SWAPPING TECHNIQUE USING FUZZY LOGIC BY SENSING THE TEMPERATURE

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### ABSTRACT

In the modern trends of computing, the exchange of external component is very essential, in order to make the programmer more comfortable for exchanging of data from one device to another. In the traditional days when ever we are going to insert the device in the running computer then, the system were unable to identify the device, so we need to restart the system each time whenever we are going to make any insertion or deletion of the peripheral as per our requirement (Social Networks of Things for Smart Homes Using Fuzzy Logic, 2018). There are many complex systems which do not fit into the precise categories of conventional set theory as i.e. based on the Boolean logic which works on either true or false i.e. 0 or 1. This paper is based on temperature sensing for hot swapping in device exchange using fuzzy logic .This paper thus presents a fuzzy logic based-temperature control system, which consists of a microcontroller, temperature sensor, Digital Converter, display interface circuit and output interface circuit (Advances in Fuzzy Systems on Real-Life Applications of Fuzzy Logic). It contains a design approach that uses fuzzy logic technique to achieve a controlled temperature output function. We have proposed the simulated voltage and temperature sensing graph also. It contains a graphical representation of different voltage fluctuation of USB ports in Matlab Software System.

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## INTRODUCTION

In the traditional days, whenever we are going to insert the device in the running computer then, the system were unable to identify the device, so we need to restart the system each time whenever we are going to make any insertion or deletion of the peripheral as per our requirement. The restarting of the computer makes the programmer more difficult to exchange the data (Social Networks of Things for Smart Homes Using Fuzzy Logic, 2018). Hence the Hot Swapping technique is taken into the consideration, where a device can be easily accepted by the system during the running condition. For this we needn't require to restart the system. A hot swap is the technique using which we can easily connect the external hard drive, CD-ROM drive, power supply, or other device with a similar device while the computer system using it remains in operation. The replacement can provide the greater flexibility for exchanging the data during running condition. Human brain has an imprecise way of reasoning and thus has a high adaptive control approach. It does not reason as computers do. Computers reason in a clear statement that uses true or false (0 or 1) - an element is either a number of a given set or it is not.

Fuzzy logic was developed owing to this imprecise nature of solving control problems by computer.

### Working principle of USB port

As the Dc power supplies to the USB port that is being embedded in CPU are usually pre charged by dedicated long pins that makes contact before the main power pins. The maximum voltage the port can handle is near about 12.0 Volts, but the average voltage being provided to the port is 5.0 Volts. These pre pins are protected by a circuit that limits the inrush current to an acceptable value that cannot damage the pins or disturb the supply voltage to adjacent slot. The RS232 Interface plays a very import role for accepting hot swapping in the devices which is a serial interface and is found in many different applications where the most common are modems and personal computers. The RS232 is a standard communication protocol for linking computer and its peripheral devices to allow serial data exchange. In simple terms RS232 defines the voltage for the path used for data exchange between the devices.

### Proposed model

In relation to RS232, generally two pins takes the working of USB , i.e. A2 (analog) pin and D8 (digital) pin, along with

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Micro controller : A2 for sensing the temperature and D8 pin for digital representation of data as per crisp logic(Binary logic). We will apply fuzzification and Defuzzification to understand to understand how USB device use hot swapping by sensing the temperature.

- **Fuzzification:** is the process of changing a real scalar value into a fuzzy value. This is achieved with the different types of fuzzifiers (membership functions).
- **Defuzzification:** is the process of producing a quantifiable result in Crisp logic, given fuzzy sets.
- **Micro-Controller:** is a pre programmed device which helps to convert Analog to Digital.

As A2 pin has different frequency range according to the power that is being supplied from SMPS. Therefore, to understand this we will apply fuzzy logic in this. Fluctuation rate standard for most USB is defined between 4.75Volts-4.99Volts. So, we will consider our member function in between these range.

Table 1.Frequency Range

4.77V	4.81V	4.85V	4.89V	4.93V	4.97V
Minute	Low	Moderate	Average	High	Extreme

Voltage fluctuation which is considered as membership function of fuzzy But, to understand the USB working environment, we are more focused on whether the USB device is being Detected by the system during swapping or not. As, the computer system is based on the crisp logic i.e. it understand only Binary code (0 or 1) (Advances in Fuzzy Systems on Real-Life Applications of Fuzzy Logic). So we need to map the fuzzy set to a binary System (Defuzzification process). So, the output value 0 will denote False (Not Detected) and value 1 will denote True (Detected).

**EXPERIMENTAL PROCESS**

If the device voltage falls in between the standard fluctuation range i.e. 4.750V – 4.990V, then port will detect its presence and show binary value 1. And if the voltage falls in between 0V to 4.7499V or 5V to 12V, then port will show 0 value, i.e. USB is not being detected by the system. The schematic diagram is as showed below Fig. 1..

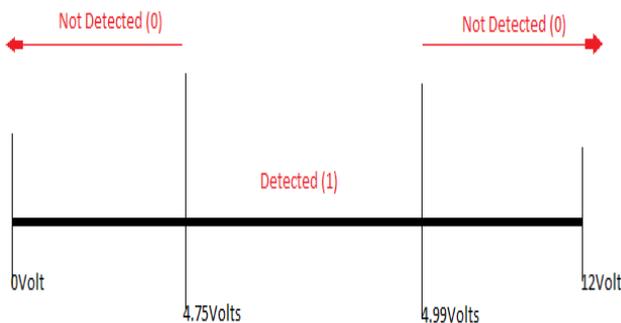


Fig. 1. Mode of Detection process

As per Detection process, the system is divided into three phases.

1. Voltage between  $0V < 4.75V$  (i.e. Not Detected)
2. Voltage between  $4.75V < 5.0V$  (i.e. Detected)
3. Voltage between  $5.0V < 12.0V$  (i.e. Not Detected)

Table 2. Temperature Detection value

Detected ( 4.75V < 5.0V )		
Temperature	Detection	Value
4.77	4.8	0.614
4.81	4.84	0.667
4.85	4.87	0.664
4.89	4.91	0.626
4.93	4.94	0.585
4.97	4.96	0.554

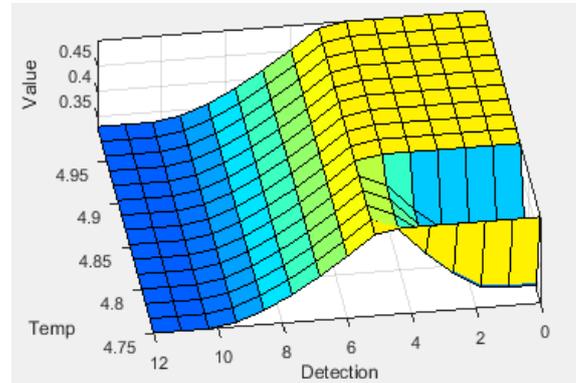


Fig. 2. Detection of Temp.

Detected (4.75V < 5.0V)

Table 3. Rejection value

Not Detected (0.0V < 4.74V )		
Temperature	Detection	Value
4.75	4.72	0.5
4.75	3.29	0.5

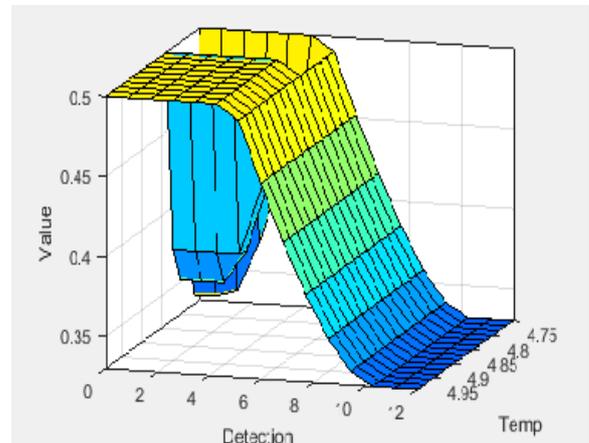


Fig. 3. Detection of Temp

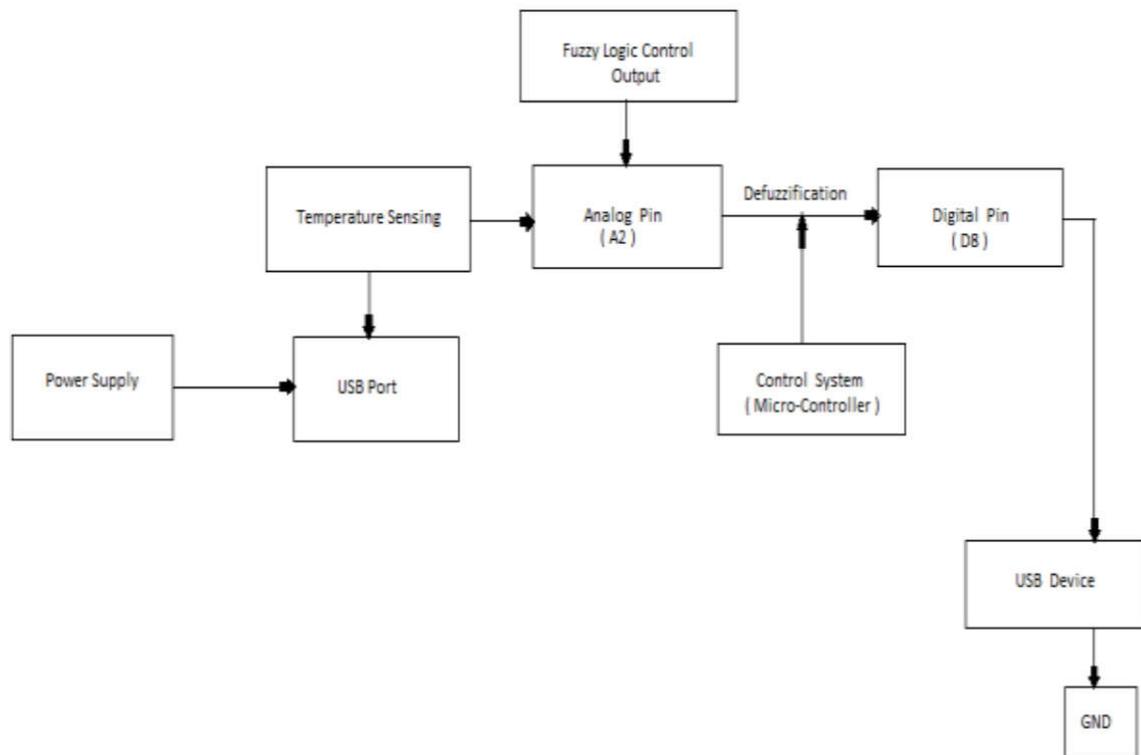
Not Detected (0.0V < 4.74V)

Table 4. Rejection value

Not Detected ( 5.0V < 12.0V )		
Temperature	Detection	Value
4.75	5.0	0.5
4.75	5.50	0.474
4.75	6.0	0.452

Not Detected (5.0V < 12.0V)

The other rejection graph is as showed below which are NOT DETECTED in the range lies between (0.0V < 4.74V) and (5.0V < 12.0V)



**Block Diagram**

**The circuit arrangement of our experiment:** The system block diagram is made up of following block items: Power supply unit (SMPS), USB Port, Analog pin (A2) for sensing the temperature, Micro-Controller (to convert A2 pin value into D8) Digital pin (D8) for crisp value (Binary value) which is understandable by the system, USB device, and GND (Ground).

### Conclusion

From the above, we conclude that, the hot swapping technique can help a lot to the modern programming world, by providing the flexibility of exchanging the component during the running environment of the system.

The user needn't have to take the burden for restating the device again and again. We are also trying to impart the improvement of this approach in the forthcoming research in terms of their portability so that we can reuse the older computer which don't have that facility but can be extended to achieve it by connecting this externally through USB port.

### REFERENCES

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