**Wi-fi enabled Digital door lock System**

The system that I have designed for my home is a **DIGITAL DOOR LOCK** where I have an Arduino with a **Wi-fi shield** and sensors. This is considered as an embedded system where I have designed a prototype of a remote security concept.

**Embedded system is the combination of electronic hardware and software which is able to perform a dedicated task.** Micro-controller is considered to be the heart of embedded system. To give logic to the micro controller, compiled .hex file has to be generated and inserted to the micro controller. Only Micro controller is not defined as embedded system, there are sensors, actuators, converters and memory which make the whole system embedded. Here I used Arduino Uno board as central microcontroller.

Usage purpose of ***Digital door lock:***

* Digital door lock is used for security purpose with very smart and efficient way.
* Digital door locks are available in market having different functionalities like RF-ID, key-pad or pattern-lock, voice recognition, image recognition, bio-metric synchronization etc.
* Door lock device can be operated by Smart device through Bluetooth or wireless fidelity (**Wi-fi**).
* The door lock can be operated remotely from any distance through Wi-fi

**Door-lock is generally used to secure the door with smart technology. I have designed a system in such a way that the door can be operated through any remote distance through Wi-fi facilities. Different types of sensors and actuators are used in the system for input and output function purposes.**

**Working functionalities:**

In the embedded device there are two parts- Hardware and Software. Software is considered as the program or logic contained in the micro controller. In the hardware part, there are micro controller, sensors, actuators, converters etc. **Sensors sense or receive signal from the environment and send the data/signal to micro controller; micro controller processes the data according to the logic and send the processed signal to the actuators; actuators receive the signal from the micro controller and form a mechanical force or movement as output.** So, sensors are used as input device and actuators are used as output device.

The sensors and actuators used in the system:

Sensors: Rf-id sensor, fingerprint sensor, ultrasonic sensor, Noise detection Sensor, LDR, IR sensor and PIR sensor

Actuators: Servo motor, DC motor, Laser module and LEDs

Hc-05 module is for Bluetooth connectivity

**ESP8266 module** has been used for Wi-fi connectivity where user can open or close the lock from any distance.

**Input and output of Digital Door lock:**

* ***Input:*** Different types of sensors can be used in Digital Door Lock System. The sensors receive any movement from the environment and send the signal to the processor or micro controller. Ultrasonic/Sonar sensor, PIR sensor, RF-ID, Bio-metric fingerprint scanner are mostly used in the Door lock system. The user is also able to control the door in Wi-fi mode also.
* **Output:**The processor processes the signal received by the sensors according to the predefined logic and send it to the actuators for output actions. Generally, high torque gear motors are used as actuators in the Digital door lock system

Characteristics of the sensors:

Sensors are responsible for sending input signal to the processor and actuators are responsible for making output according to the command signal from the micro controller. *There are different types of sensors and actuators which are used in the embedded system according to different functionalities. Some sensors are visually responsive, some are sound based, some are touch sensitive and some are work with respect to the variation of electrical signal*.

* **Visual-** The sensors which works with the existence of visible light are known as visually responsive sensors. When the visible light falls on the sensor module, it sends the signals to the micro controller. LDR is one of the photo electric sensor.
* **Audio-** There are some sensors which is able to detect the sound. When the sound is detected by the sensor, it creates the signal to send it to the micro controller. Ex: Noise detection Sensor, Clap monitoring, voice recognition etc.
* **Tactile-**Some sensors work with physical action like touching. Touch sensor like touch panels, buttons or screen are widely used in the world. Fingerprint sensors are used for security purposes. After touching the panel, the module generates the signals.

**Electronic-** There are many devices which works and can be controlled by the variation of electrical signal. Sensors generate the signal; processor processes the received signal and actuator devices receive the processed signal and make the physical output. The output may be varied with respect to the variation of the signal.

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