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Fingerprint based Door Opening System

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ABSTRACT: The use of fingerprint for identification has been employed in law enforcement for about a century. A fingerprint locker system using microcontroller uses fingerprint recognition system as a process of verifying the fingerprint image to open the electronic lock. This research highlights the development of fingerprint verification system using Arduino 1.6.3. Verification is completed by comparing the data of authorized fingerprint image with incoming fingerprint image. The incoming fingerprint image will first go through the extraction and filtering processes through which the information about it is obtained. Then the information of incoming fingerprint image will undergo the comparison process to compare it with authorized fingerprint image. In this work, the fingerprint module was trained to learn and identify whether the incoming fingerprint image is genuine or forgery. A much broader application of fingerprint is for personal authentication, for instance to access a computer, a network, an ATM-machine, a car, or a home.

I. INTRODUCTION

Biometric systems have overtime served as robust security mechanisms in various domains. Fingerprints are the oldest and most widely used form of biometric identification. The use of fingerprint for identification has been employed in law enforcement for about a century. A much broader application of fingerprint is for personal authentication, for instance to access a computer, a network, an ATM machine, a car or a home.
Electronic lock using fingerprint recognition system is a process of verifying the fingerprint image to open the electronic lock. This project highlights the development of fingerprint verification. Verification is completed by comparing the data of authorized fingerprint image with incoming fingerprint image. Then the information of incoming fingerprint image will undergo the comparison process to compare with authorized fingerprint image.
Fingerprint door lock incorporates the proven technology. Fingerprint reader scanning is the most mature and tested type of biometric technology. Recent studies on biometrics have shown that compared to the hand method, fingerprint is more accurate and cost-effective. The duplication of biometric fingerprint technology is virtually impossible, only one in one billionth of a chance. Biometric security guarantees a positive method of user identification with something that cannot be lost, replicated or stolen.

II. HARDWARE DESCRIPTION

ARDUINO

Arduino is an open-source electronic platform based on easy-to-use hardware and software. Arduino boards are able to read inputs – light on sensor, a finger on a button, or a Twitter message – and turn it into an output – activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on writing), and the Arduino software (IDE), based on processing.
Over the years Arduino has been the brain of thousands of projects, from everyday objects to complex scientific instruments. A worldwide community of makers students, hobbyists, artists, programmers, and professionals – has gathered around this open source platform, their contributions have added up to an incredible amount of accessible knowledge that can be of great help to novices and experts alike.
Arduino was born at the Ivrea interaction design institute as an easy tool for fast prototyping, aimed at students without a background in electronics and programming. As soon as it reached a wider community, the Arduino board started changing to adapt to new needs and challenges, differentiating its offer from simple 8-bit boards to products for IOT applications, wearable, 3D printing, and embedded environments. All Arduino boards are completely open-source, empowering users to build them independently and eventually adapt them to their particular needs. The software, too, is open –source, and it is growing through the contributions of users worldwide.

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ARDUINO MEGA (2560)

FIG:- ARDUINO MEGA (2560) MODULE

SERVO MOTOR

A servomotor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration. It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors.

Servomotors are not a specific class of motor although the term servomotors often used to refer to a motor suitable for use in a closed–loop control system.

FINGERPRINT SENSOR

A fingerprint is an impression left by the friction ridges of a human finger. The recovery of partial fingerprints from a crime scene is an important method of forensic science. Moisture and grease on a finger result in fingerprints on surfaces such as glass or metal. Deliberate impressions of entire fingerprints can be obtained by ink or other substances transferred from the peaks of friction ridges on the skin to a smooth surface such as paper. Fingerprint records normally contain impressions from the pad on the last joint of fingers and thumbs, although fingerprint cards also typically record portions of lower joint areas of the fingers.

Human fingerprints are detailed, nearly unique, difficult to alter, and durable over the life of an individual, making them suitable as long-term markers of human identity. They may be employed by police or other authorities to identify individuals who wish to conceal their identity, or to identify people who are incapacitated or deceased and thus unable to identify themselves, as in the aftermath of a natural disaster.

BATTERY

The nine-volt battery, or 9-volt battery, is a common size of battery that was introduced for the early transistor radios. It has a rectangular prism shape with rounded edges and a polarized snap connector at the top. This type is commonly used in walkie–talkies, clocks and smoke detectors.

The nine-volt battery format is commonly available in primary carbon-zinc and alkaline chemistry, in primary lithium iron disulfide, and in rechargeable form in nickel-cadmium, nickel-metal hydride and lithium-ion. Mercury-oxide batteries of this format, once common, have not been manufactured in many years due to their mercury content. Designations for this format include NEDA 1604 and IEC 6F22 (for zinc-carbon) or MN1604 6LR61 (for alkaline). The size, regardless of chemistry, is commonly designated PP3—a designation originally reserved solely for carbon-zinc, or in some countries, E or E-block.

LCD DISPLAY

A liquid-crystal display (LCD) is a flat–panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals. Liquid crystals do not emit light directly, instead using a backlight or reflector to produce images in colour or monochrome. LCDs are available to display arbitrary images (as in a general-purpose computer display) or fixed images with low information content, which can be displayed or hidden, such as present words, digits, and seven–segment displays, as in a digital clock. They use the same basic technology, except that arbitrary images are made up of a large number of small pixels, while other displays have larger elements. LCDs can either be normally on (positive) or off (negative), depending on the polarizer arrangement. For example, a character positive LCD with a backlight will have black lettering on a background that is the color of the backlight, and a character negative LCD will have a black background with the letters being of the same color as the backlight. Optical filters are added to white on blue LCDs to give them their characteristic appearance.

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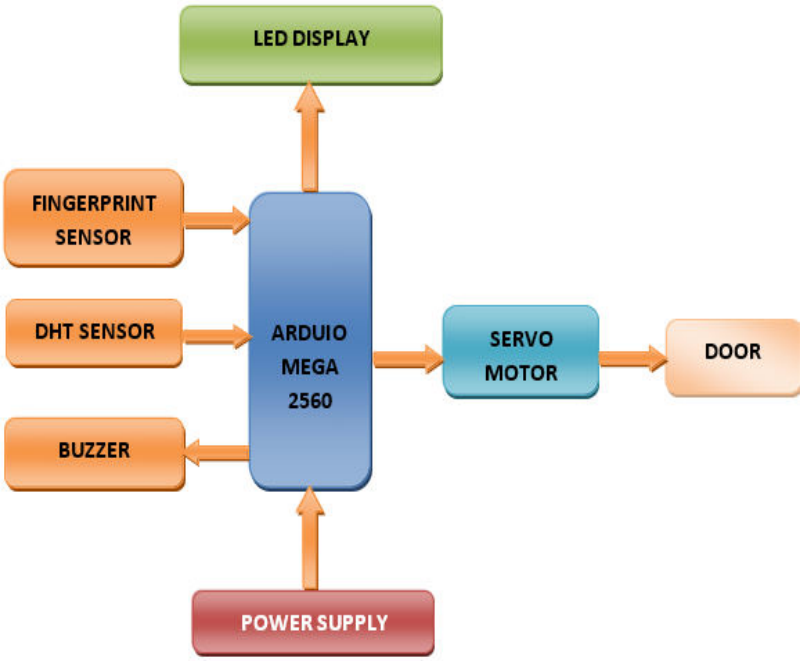
DHT SENSOR

This tutorial covers the low cost DHT temperature & humidity sensors. These sensors are very basic and slow, but are great for hobbyists who want to do some basic data logging. The DHT sensors are made of two parts, a capacitive humidity sensor and a thermistor. There is also a very basic chip inside that does some analog to digital conversion and spits out a digital signal with the temperature and humidity. The digital signal is fairly easy to read using any microcontroller.

BLOCK DIAGRAM



CIRCUIT DIAGRAM & OPERATION

CIRCUIT DIAGRAM

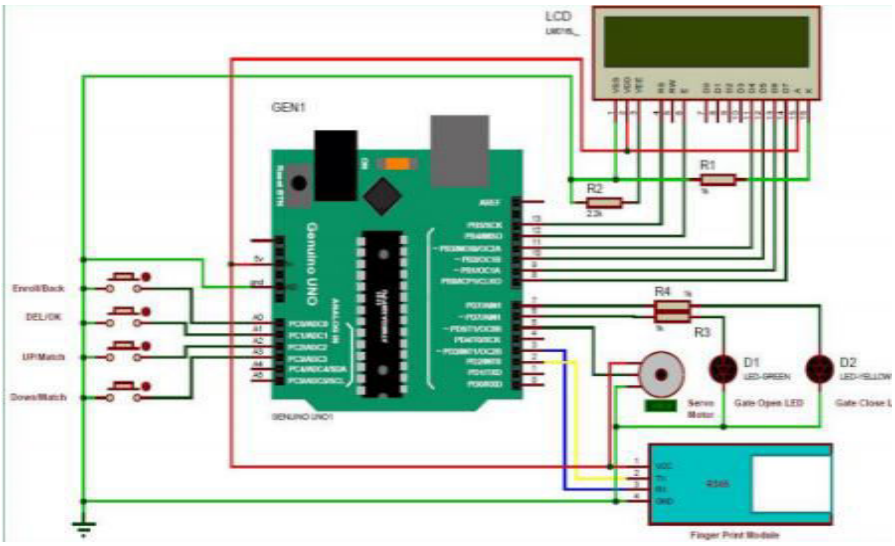


FIG:-CIRCUIT DIAGRAM OF ARDUINO BASED BIOMETRIC FINGERPRINT DOOR LOCK

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III. OPERATION

The circuit of this Arduino Fingerprint Security System is very simple which contains Arduino Mega2560 which controls whole the process of the project, push button, buzzer, and LCD. Arduino Mega2560 controls the complete processes.

The push button is directly connected to pin A9 (ENROL), A10 (OK/DEL), A11 (UP), A12 (DOWN) and A8 (CLOSED) of Arduino Mega2560 with respect to ground and Red LED is connected at Digital pin D4 of Arduino Mega2560 with respect to ground through a 10 ohms resistor and Green LED is connected to D3 of Arduino Mega2560 with the same method. Fingerprint Module's Rx and Tx directly connected at Software Serial or Digital pin D11 and D10 of Arduino Mega2560. 5v supply is used for powering finger print module taken from Arduino Mega pin and Servo motor is also connected to PWM pin D5 of Arduino mega2560. A 16×2 LCD is configured in 4-bit mode and its RS, EN, D4, D5, D6, and D7 are directly connected at Digital pin D13, D12, D6, D7, D9, and D8 of Arduino Mega2560. Buzzer is connected at the Digital pin D14 of Arduino Mega2560 and with respect to the ground. DHT is connected at the Digital pin D2 of Arduino Mega2560 and with respect to the ground and Vcc. Potentiometer of middle pin is connected LCD (Vo).
Firstly, "Enroll" button is pressed to enroll the finger print of the authenticate user. Finger print is stored by pressing "OK/Del" button. Gate is closed by pressing the "Close" button of the module.

When any user tries to open the gate, module checks the authenticity of the user by comparing his/her fingerprint with the database, if the users fingerprint matches with the one that is stored in the database, then Arduino sends the signal to run the motor which then opens the gate with the "WELCOME" "DOOR OPENED" message on the LCD.

PROGRAM FLOW CHART

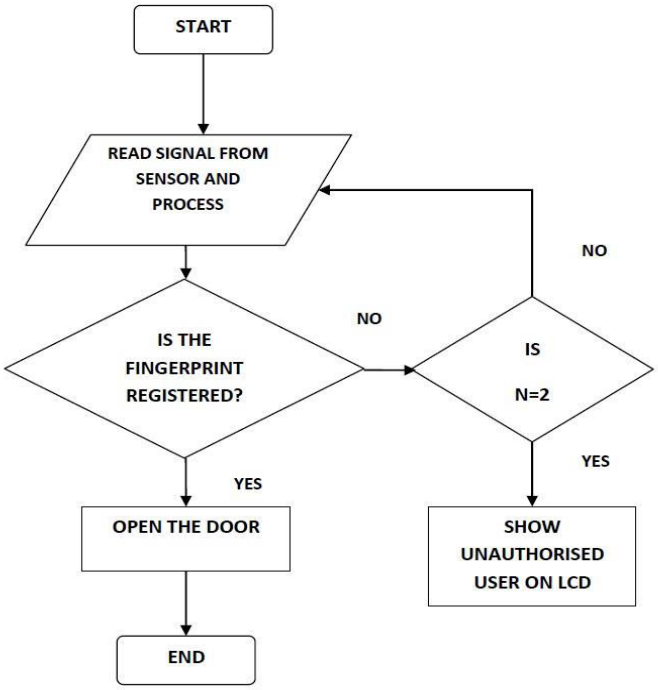

Fig. The program flow chart

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FUTURE IMPROVEMENTS

Advancements in biometric identification management technology are moving so fast, in future we will make advancement and multi functions like SMS alert if authorized person try to lock the door. Image recognizing process system and password system based. Also, eyes retina for password which helps authorized persons for authentication for entrance so biometric technology makes individual convenient in real life.

IV. TESTS, RESULTS AND DISCUSSION

This section deals with the description of tests performed on the various sections of the overall system and their corresponding results as well as the result of the overall system. In order to verify the correct functionality of the system, each component had to be tested individually. To achieve the effective testing of these various components, the following tools were used:

- ♣ Digital multimeter
- ♣ Bread board
- ♣ Logic probe
- ♣ Light emitting diodes
- ♣ Arduino 1.6.3. software

The testing was done on each and every components/sections that make up the circuit to ensure proper and satisfactory operation of the fingerprint lock. The debugging was done using the Arduino 1.6.3; Each and every section of the code was debugged properly to ensure proper functionality thus a step debugging was done. This is a facility in the software that enables you step into program and at the same time views the registers and flag settings.

V. CONCLUCSION

Fingerprint door locks are great investment for home or business. It provides great security by providing restrictions to unwanted access. This device increases level of security by adding unique biological features of authorized person. For anyone who wants more security to their homes, fingerprint door locks are best choice.

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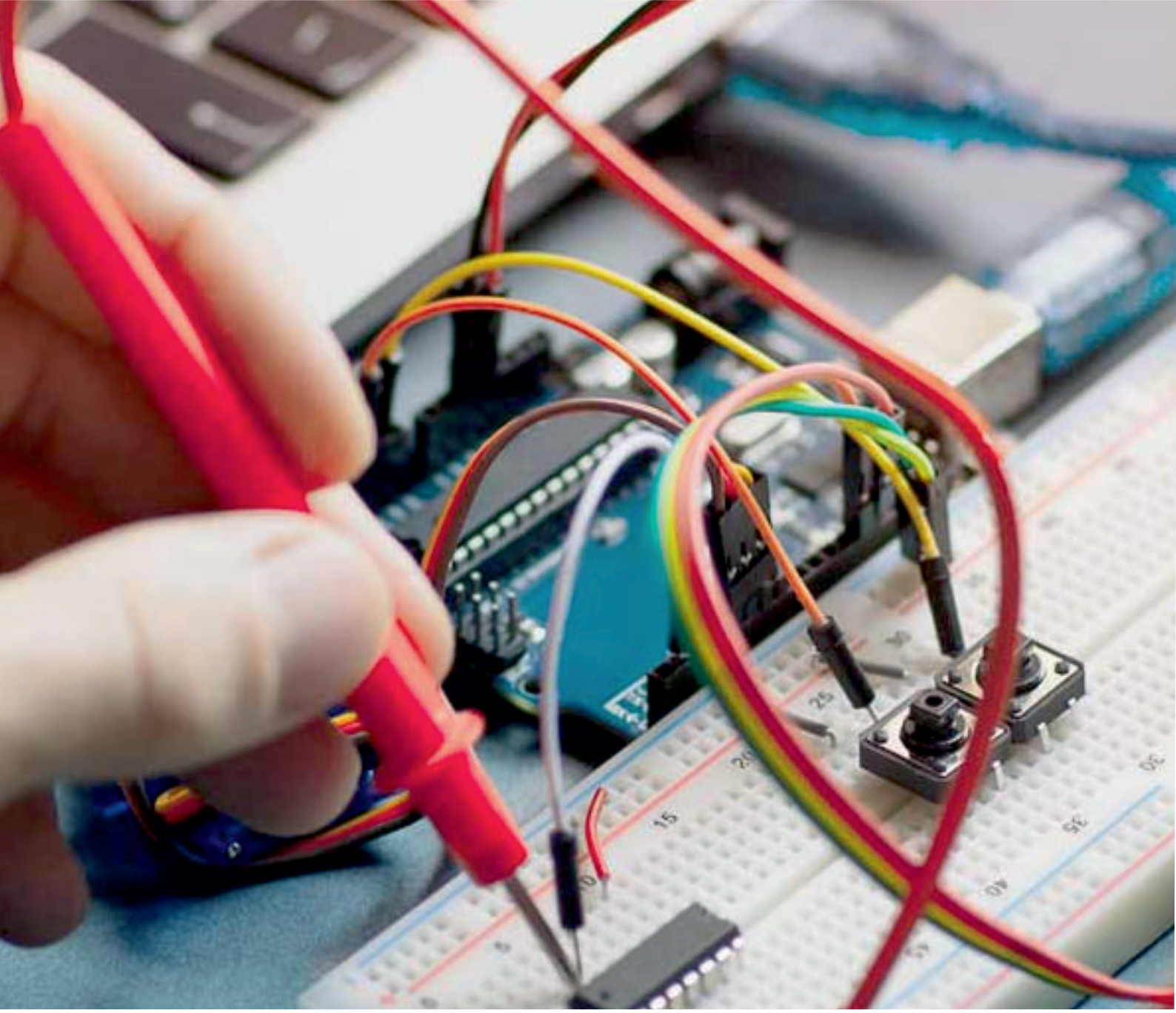

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