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BLUE-KEY

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ABSTRACT

Remote Controlling already exists in our daily life and is not a new concept. But here we came with a new technology in the controlling system. We are going to use our mobile for this purpose. As mobile is a very common device that every person carries all the time. Taking the advantage of this phenomenon; we are going to use this as remote for controlling home doors increasing the luxury of life with some added advantages.

What is more natural than using a key to unlock a door? It is something that everyone does almost every day, and it is an integrated part of our daily life. It is also a very well-known and well-tested technology. Despite these arguments, keys as we know them might not be the device of choice to open doors in the future. We have all experienced problems like carrying too many keys while forgetting the one key we need, or maybe having a lock replaced because we lost a single key.

Indexing terms/Keywords: Bluetooth as home security, J2ME interface, home security.

SUBJECT CLASSIFICATION: Hardware components interfaced with software using java/J2ME.

TYPE (METHOD/APPROACH) : The research got initiated by the looking at the current scenario of home security and some technologies iniitatiated by various technology available, software logic approached by using java platform.

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INTRODUCTION

- **Objective**

The physical key is an integrated and natural part of most people's life. It is a well-tested and well-known technology, but it also has its flaws. In particular, for companies needing access to many different private buildings, each with its own lock and key, the distribution of keys to the right employee at the right time is a complex and costly affair. Furthermore, carrying a large number of keys is a burden for each employee and increases the chance of keys getting stolen or lost.

Fig 1

Our goal is to design a solution for secure access control that can replace physical keys for accessing private buildings. We propose a solution using digital keys on Bluetooth-enabled mobile phones providing wireless and automatic unlocking. The design allows easy distribution of keys to users, with access control enforced by easily deployable autonomous lock devices allowing a non-centralized multi-company approach.

- **Existing System**

The problem with physical keys has even bigger implications for companies in the business of mail or goods delivery. These companies need access to many different private buildings. Doors spread over a wide geographical area and governed by many different owners. Personnel need to carry keys for each single door on the delivery route. Carrying all these keys (literally kilograms)

is a hassle in the daily use and vulnerable to theft. But just as important, routes, personnel, and locks change over time, making it a resource consuming operation to assure that all personnel have the right keys at the right time.

- **Proposed System**

To tackle the above issues, we propose to replace physical keys with digital keys that:

- can easily be distributed to users
- can only be used by the correct user
- can be specialized for each user so each key will be unique
- can be restricted to a given time or date range
- allows many keys to be contained in the same small device

We propose to use a mobile phone equipped with Bluetooth as the mobile device. First, mobile phones are getting very common and bringing your mobile phone with you is becoming as natural as bringing your keys. Second, mobile phones are becoming increasingly open to third-party developers, while the hardware at the same time is getting more and more powerful. This makes mobile phones a suitable platform for uses beyond making and receiving phone calls. Combined with the ability to perform short-range wireless communications via Bluetooth, the mobile phone is a good candidate for the mobile device.

User will require installing the mobile application software on the Bluetooth enabled mobile. The hardware will be installed in the door. The following are the steps that will explain the flow of operation…

- Start the Application in mobile,

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- Pair the mobile once with the door hardware,
- Enter the pre-defined password in the mobile software to get access, or create a new password.
- Get the access of the door by selecting Lock-Unlock option on the mobile.
- If the password matches then only the system will give access for the door.

. Block Diagram

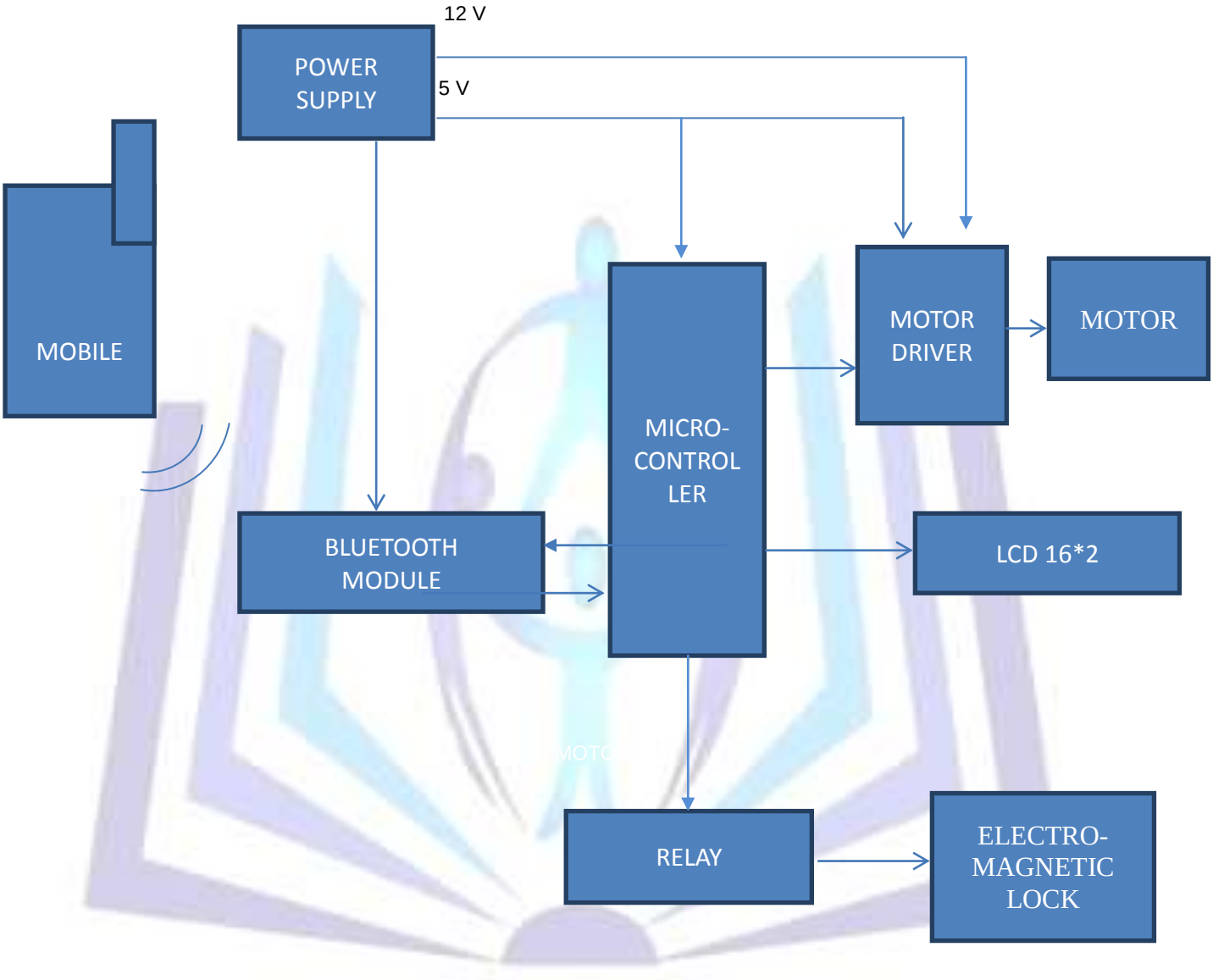

Fig. 2

The basic block diagram consist of a microcontroller, a Bluetooth module, a constant regulated power supply, a motor driver to run the motor which will be attached to the door. The power supply provides 5Vdc to all the ICs. The Bluetooth module communicates with the GMS handset and transfer the data to be verified to the microcontroller. It is connected to AT89S52 via the Tx and Rx lines. The output of the microcontroller is given to a motor driver IC(L293D). this is done to amplify the current at the output of of AT89S52 since it is enough to power the running of a motor. Once the proper code is verified and authentication is done, the motor will run, thus opening or closing the door.

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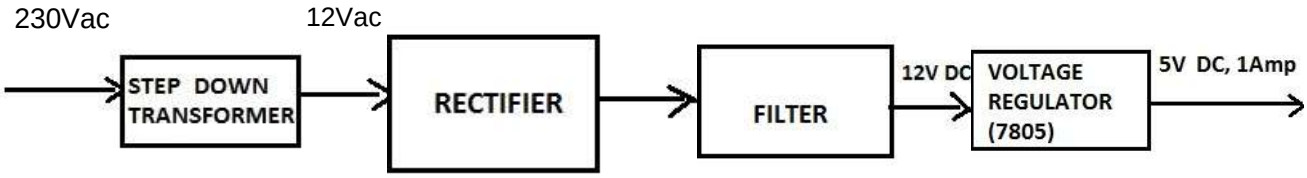
EXLANATION OF BLOCKS

The following are the brief explanations of the working principle of the various major blocks or sections used in the system:

- **Power supply**



The microcontroller and other devices get power supply from AC to DC adapter through voltage regulator. The adapter output voltage will be 12Vdc non-regulated. The 7805 voltage regulator are used to convert 12V to 5Vdc.

4.2 Microcontroller

A microcontroller (sometimes abbreviated µC, uC or MCU) is a small computer on a single integrated circuit containing a processor core, memory, and programmable input/output peripherals. Program memory in the form of NOR flash or OTP ROM is also often included on chip, as well as a typically small amount of RAM. Microcontrollers are designed for embedded applications, in contrast to the microprocessors used in personal computers or other general purpose applications.

Microcontrollers are used in automatically controlled products and devices, such as automobile engine control systems, implantable medical devices, remote controls, office machines, appliances, power tools, toys and other embedded systems. By reducing the size and cost compared to a design that uses a separate microprocessor, memory, and input/output devices, microcontrollers make it economical to digitally control even more devices and processes. Mixed signal microcontrollers are common, integrating analog components needed to control non-digital electronic systems.

They will generally have the ability to retain functionality while waiting for an event such as a button press or other interrupt; power consumption while sleeping (CPU clock and most peripherals off) may be just nanowatts, making many of them well suited for long lasting battery applications.

This unit is the heart of the complete system. It is actually responsible for all the process being executed. It will monitor & control all the peripheral devices or components connected in the system. In short we can say that the complete intelligence of the project resides in the software code embedded in the Microcontroller.

The controller here use will be of 8051 family. The code will be written in Embedded C and will be burned or programmed into the code memory using a programmer.

This unit requires +5VDC for it proper operation.

- **Description of AT89S52**

The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the industry- standard 80C51 instruction set and pinout. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with in-system programmable Flash on a monolithic chip, the Atmel AT89S52 is a powerful microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications. The AT89S52 provides the following standard features: 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointers, three 16-bit timer/counters, asix-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry. In addition, the AT89S52 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port, and interrupt system to continue functioning. The Power-down mode saves the RAM contents but freezes the oscillator, disabling all other chip functions until the next interruptor hardware reset.

- **LCD 16x2**

It is called Liquid Crystal Display. We are going to use 16x2 character LCD. This will be connected to microcontroller. The job of LCD will be to display all the system generated messages coming from the controller. LCD will provide interactive user interface.

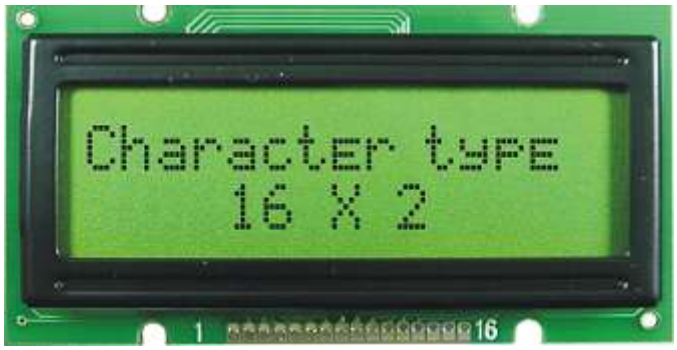


Fig 4

- **DC motor driver**

  This unit is nothing but H-Bridge driver encapsulated in a single IC. Here we will use L293D IC for DC motor driving. It can drive up to 4 DC motors in unidirectional mode and 2 DC motors in bidirectional mode. It can sink up to 600mA per Channel.

  The job of this unit is to drive the connected motors in desired direction when microcontroller sends signal to their respective channels.

  This unit requires +12VDC for it proper operation.

  Logic 01 and 10 will rotate it in clockwise and anticlockwise directions, respectively.

  Enable pins 1 and 9. Enable input is high, the associated driver gets enabled, outputs become active

  Enable input is low, that driver is disabled, and their outputs are off and in the high-impedance state.

- **DC Motor**

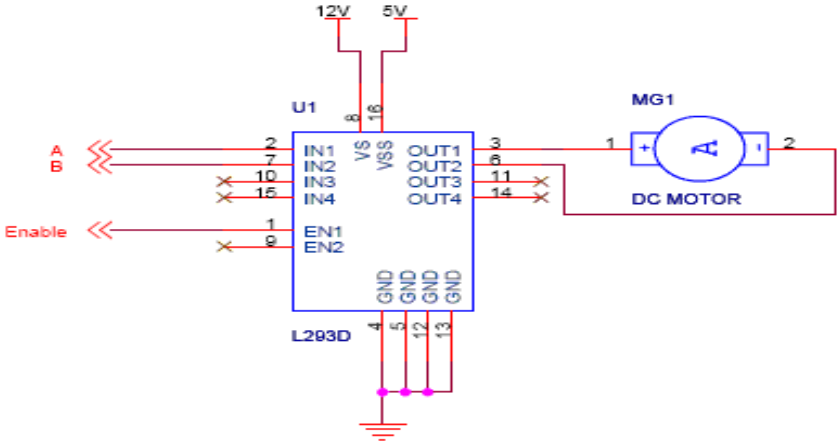
  A DC motor is an electric motor that runs on direct current (DC) electricity. DC motors were used to run machinery, often eliminating the need for a local steam engine or internal combustion engine. DC motors can operate directly from rechargeable batteries, providing the motive power for the first electric vehicles.

  Here we are going to use DC Geared Motors of 10/30/45 RPM. The voltage required to drive the motors are 12VDC and current is nearly 200mA. Gears are used for more torque.

  This unit requires +12VDC for it proper operation.

Fig.5

Working



Truth Table

A	B	Description
0	0	Motor stops or Breaks
0	1	Motor Runs Anti-Cloclwise
1	0	Motor Runs Clockwise
1	1	Motor Stops or Breaks

Fig 6

- **Bluetooth module**

The RN42 is a small form factor, low power, highly economic Bluetooth radio for OEM's adding wireless capability to their products. The RN42 supports multiple interface protocols, is simple to design in and fully certified, making it a complete embedded Bluetooth solution. The RN 42 is functionally compatible with RN 41. With its high performance on chip antenna and support for Bluetooth® Enhanced Data Rate (EDR), the RN42 delivers up to 3 Mbps data rate for distances to 20M. The RN-42 also comes in a package with no antenna (RN-42-N). Useful when the application requires an external antenna, the RN-42-N is shorter in length and has RF pads to route the antenna signal.

Fig 7

- **Features**
  - Fully qualified Bluetooth 2.1/2.0/1.2/1.1 module
  - Bluetooth v2.0+EDR support
  - Available with on board chip antenna (RN- 42) and without antenna (RN-42-N)
  - Postage stamp sized form factor, 13.4mm x 25.8 mm x 2mm (RN-42) and 13.4mm x 20 mm x 2 mm (RN-42-N)
  - Low power *(26uA sleep, 3mA connected, 30mA transmit)*
  - UART (SPP or HCI) and USB (HCI only) data connection interfaces.
  - Sustained SPP data rates - 240Kbps (slave), 300Kbps (master)
  - HCI data rates - 1.5Mbps sustained, 3.0Mbps burst in HCI mode

- Embedded Bluetooth stack profiles included *(requires no host stack*): GAP, SDP, RFCOMM and L2CAP protocols, with SPP and DUN profile support.
- Bluetooth SIG certified
- Castellated SMT pads for easy and reliable PCB mounting

- **Relay**

This unit provides actual switching of external device connected to the pin of relay. The voltage of the coil of the relay is 12V. That means it will energies at minimum 12 voltage on across it. After tenderization of the coil the mechanical key present inside the relay switches to its other position and vice versa. This gives a heavy induced e.m.f. which can cost the rest of circuit to burn out but this is prevented by using a diode in parallel with the coil in opposite direction.

The BC547 transistor is used as an electronic switch to pull down the voltage of coil to the ground. This helps the closed circuit between the power supply and the ground through the coil. The switching of transistor is done by applying nearly 12V on its base through the resistor which limits the current.

- **Buzzer**

A buzzer is audio signaling device used for alarm purposes.

Mechanical: A joy buzzer is an example of a purely mechanical buzzer.

Electromechanical: Early devices were based on an electromechanical system identical to an electric bell without the metal gong. Similarly, a relay may be connected to interrupt its own actuating current, causing the contacts to buzz. Often these units were anchored to a wall or ceiling to use it as a sounding board. The word "buzzer" comes from the rasping noise that electromechanical buzzers made.

Piezoelectric: A piezoelectric element may be driven by an oscillating electronic circuit or other audio signal source, driven with a piezoelectric audio amplifier. Sounds commonly used to indicate that a button has been pressed are a click, a ring or a beep

- Figure 8: Piezoelectric buzzer

- **What is J2ME?**

J2ME is the Java 2 Micro Edition, meant for small devices, such as cell phones, TV set top boxes, Pagers, PDAs, Telemetric devices, etc.

The J2ME was designed for small devices considering the following characteristics:

- Limited processing power
- Limited system memory
- Limited storage capacity

- Small Display
- Less battery power
- Limited connectivity

- **Why J2ME?**

There are five major cell phone platforms available today: Symbian, Windows Mobile, BREW**,** and J2ME. Each is worth investigating; depending on the nature of the problem to be solved and the resources and people available, a particular platform may stand out.

- **J2ME Mobile Software**

Fig. 9

- **Compatibility with other cell phones**

Symbian is an operating system for cell phones. Later versions of Symbian do support J2ME. Windows Mobile is Microsoft's mobile solution. This platform is aimed at relatively high-end devices and developers with Windows expertise.

BREW is a C++ based framework that has support from Verizon Developers for this platform can rely upon the phone carrier for billing and deployment. However, the certification process required for such support is an obstacle for small companies. IBM has built a JVM for BREW.

J2ME is a Java based platform for cell phones. It includes almost everything needed to develop software: a GUI, persistent data storage, and network access. It is supported by a majority of cell phone carriers across the globe, has no licensing issues, and is well documented.

One benefit of choosing J2ME is the widespread support for this platform. In addition to the Symbian and BREW support mentioned above, there are implementations for PalmOS and methods of turning J2ME applications into native Blackberry applications. J2ME applications are also relatively easy to deploy initially, especially when compared to BREW applications.

- **Useful J2ME tools**

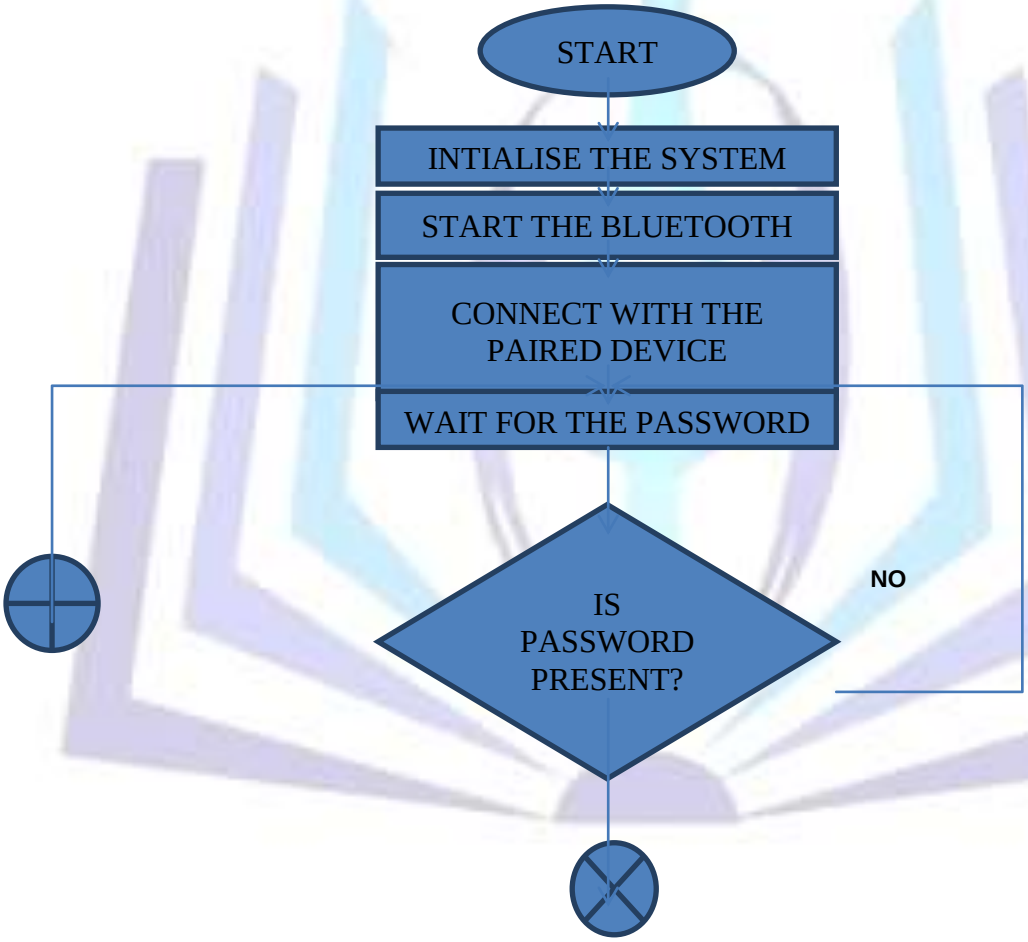
J2ME emulators mock up the J2ME runtime environment on a desktop PC, allowing development to occur on a device that has more memory, a faster network connection, and a keyboard. Emulators are available from many sources: Sun, IBM, most device manufacturers and even a few carriers. The Sun Wireless Tool Kit (WTK) has an excellent emulator. IBM's WebSphere Device Developer (WSDD) has an emulator integrated with an IDE; this Made for a great development environment. Both of these emulators support Windows and Linux. However, most cell phone emulators only run on Windows. Other emulators can be downloaded from device manufacturers' or carriers' websites.

The size of the application jar file can be important, if for no other reason than application download time. Obfuscators are java programs that can be used with any class file; they twiddle with byte code and rename classes and variables to make de-compilation more difficult. As a happy side effect, however, they also decrease the size, of class files.

- **Steps to develop J2ME based GUI**

1. Import all the packages necessary for development of a program (e.g. io, lcdui, midlet package etc.)
2. Define main class, extending MIDlet& implementing CommandListener.
3. Initialize parameters required for display of GUI.
4. Initialize parameters required for Data stream connections, and Commands.
5. Initialize constructor method in which instances of display class, command class are created.
6. Invoke methods startApp(), pauseApp(), &destroyApp(). Methods to actually start the implementation of program are written in startApp().
7. Invoke the methods to start Bluetooth connection
8. Invoke the method run() which starts communication which takes input from user, & sends data via Bluetooth protocol to the Bluetooth module
9. Listen to the acknowledgment from Bluetooth module & display on user interface.

- **Algorithm**



TO OPEN THE DOOR

TO CLOSE THE DOOR

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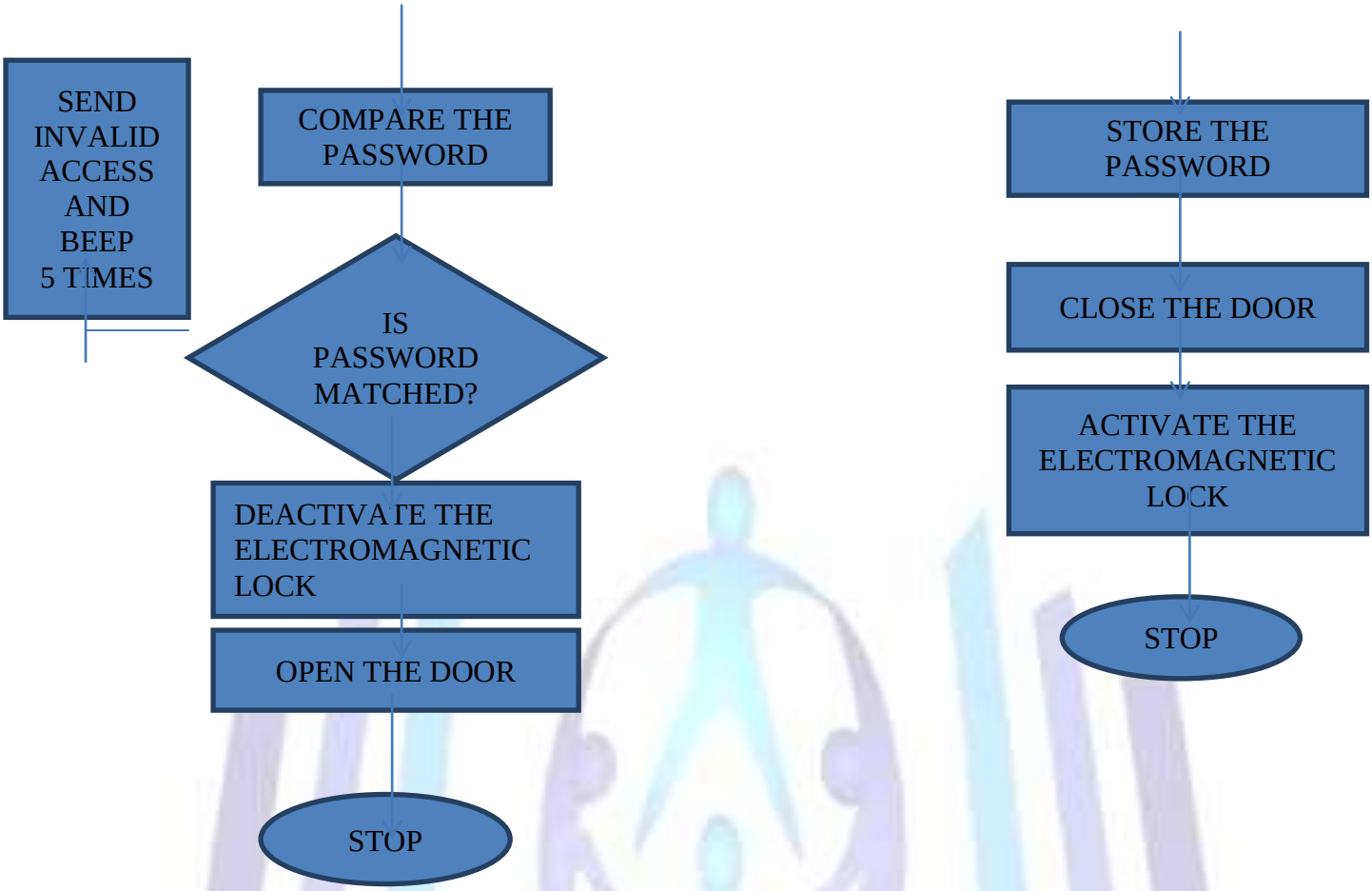

- **CONCLUSION**

By the realization of the above proposed system one can learn many aspects of a digital electronics circuit. This will give the complete knowledge of designing microcontroller based system and developing embedded software.

We will also learn the software development strategies and various programming techniques for Mobile based applications

- **Advantages**

  - can easily be distributed to users
  - can only be used by the correct user
  - can be specialized for each user so each key will be unique I• can be restricted to a given time or date range
  - allows many keys to be contained in the same small device

- **Limitations**

  - In case of loss of the cell phone, person should have another cell phone with same software.
  - Initial cost is high as compared to only mechanical lock. I Power failure (Power cut) must be taken care of.

- **Future scope**

We can add motion detector, CCTV, LCD display, SMS module, alarm, etc.

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