PDPM IIITDM JABALPUR

PROJECT ON – MICROCONTROLLER BASED APPLICATION

FINAL REPORT

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TOPIC – ATTENDANCE SYSTEM WITH DATA LOGGER

COMPONENTS USED (HARDWARE):

- Arduino UNO R3

- RFID module (Virtual Terminal is used in Simulation Process)

- LCD display

- RFID cards

- SD card

- SD Card module

- RTC Module

- Connecting wires – jumper wires

- Breadboard

WHAT IS A MICROCONTROLLER ?

A microcontroller is a compact integrated circuit designed to govern a specific operation in an embedded system.

Microcontroller can be termed as a single on chip computer which includes number of peripherals like RAM, EEPROM, Timers etc., required to perform some predefined task.

The computer on one hand is designed to perform all the general purpose tasks on a single machine like you can use a computer to run a software to perform calculations or you can use
a computer to store some multimedia file or to access internet through the browser, whereas the microcontrollers are meant to perform only the specific tasks, for e.g., switching the AC off automatically when room temperature drops to a certain defined limit and again turning it ON when temperature rises above the defined limit.

WHAT IS A MICROCONTROLLER? (CONTD.)

There are number of popular families of microcontrollers which are used in different
applications as per their capability and feasibility to perform the desired task, most common of these are 8051, AVR and PIC microcontrollers.

Microcontrollers are found in vehicles, robots, office machines, medical devices, mobile radio transceivers, vending machines and home appliances, among other devices. They are essentially simple miniature personal computers (PCs) designed to control small features of a larger component, without a complex front-end operating system (OS).

WHAT IS RFID ?

Radio-frequency identification (RFID) uses electromagnetic fields to automatically identify and track tags attached to objects. An RFID system consists of a tiny radio transponder, a radio receiver and transmitter. When triggered by an electromagnetic interrogation pulse from a nearby RFID reader device, the tag transmits digital data, usually an identifying inventory number, back to the reader. This number can be used to track inventory goods.

RFID tags can be of two types- active or passive. Passive tags are powered by energy from the RFID reader's interrogating radio waves. Active tags are powered by a battery and thus can be read at a greater range from the RFID reader, up to hundreds of meters.

Unlike a barcode, the tag does not need to be within the line of sight of the reader, so it may be embedded in the tracked object. RFID is one method of automatic identification and data capture (AIDC).[

ARDUINO UNO

Arduino UNO is a microcontroller board based on the **ATmega328P**. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header and a reset button. It has 32KB of flash memory and 2 KB of SRAM.

The UNO is the most used and documented board of the whole Arduino family

RFID MODULE

- The RC522 RFID reader module is designed to create a 13.56MHz electromagnetic field and communicate with RFID tags (ISO 14443A standard tags).

- The reader can communicate with a microcontroller over a 4-pin SPI with a maximum data rate of 10 Mbps. It also supports communication over I2C and UART protocols.

- The RC522 RFID module can be programmed to generate an interrupt, allowing the module to alert us when a tag approaches it, instead of constantly asking the module "Is there a card nearby?".

- The module's operating voltage ranges from 2.5 to 3.3V

SD CARD MODULE

- SD Card Module is a breakout board used for SD card processes such as reading and writing with a microcontroller. The board is compatible with microcontroller systems like Arduino. A standard SD card can be directly inserted into the board, but to use microSD cards, you need to use an adapter.

- SD Card Module can be used in any project that requires data reding and writing. The board has built in 3.3V voltage regulator.

RTC MODULE

A real time clock, or RTC, is a digital clock with a primary function to keep accurate track of time even when a power supply is turned off or a device is placed in low power mode. RTC's are comprised of a controller, oscillator, and an embedded quartz crystal resonator. They are engineered as all-in-one devices to provide better performances than discrete components, simplify integration in new designs, and accelerate time to market.

WORKING

- When the RFID reader reads an RFID tag, it saves the current time and the UID of the tag in an SD card. The Arduino communicates with the SD card using an SD card module.

- You can set a check-in time to compare if you are on time or late. If you are on time, a "Welcome" message is displayed, if you are late, a "You are late" message is displayed. The system also has a buzzer that beeps when a tag is read.

Flow chart of one cycle
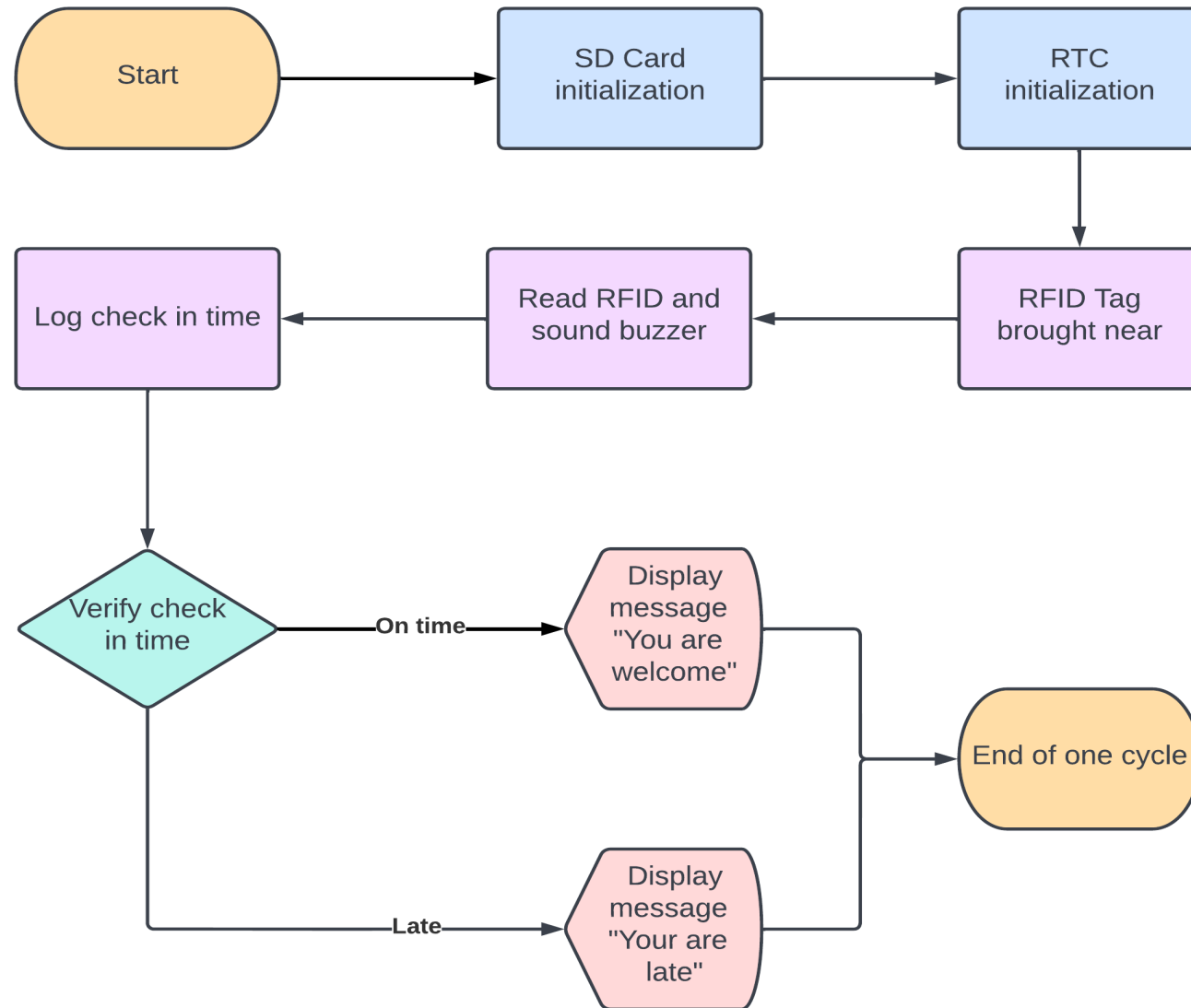
Hardware Circuit Diagram
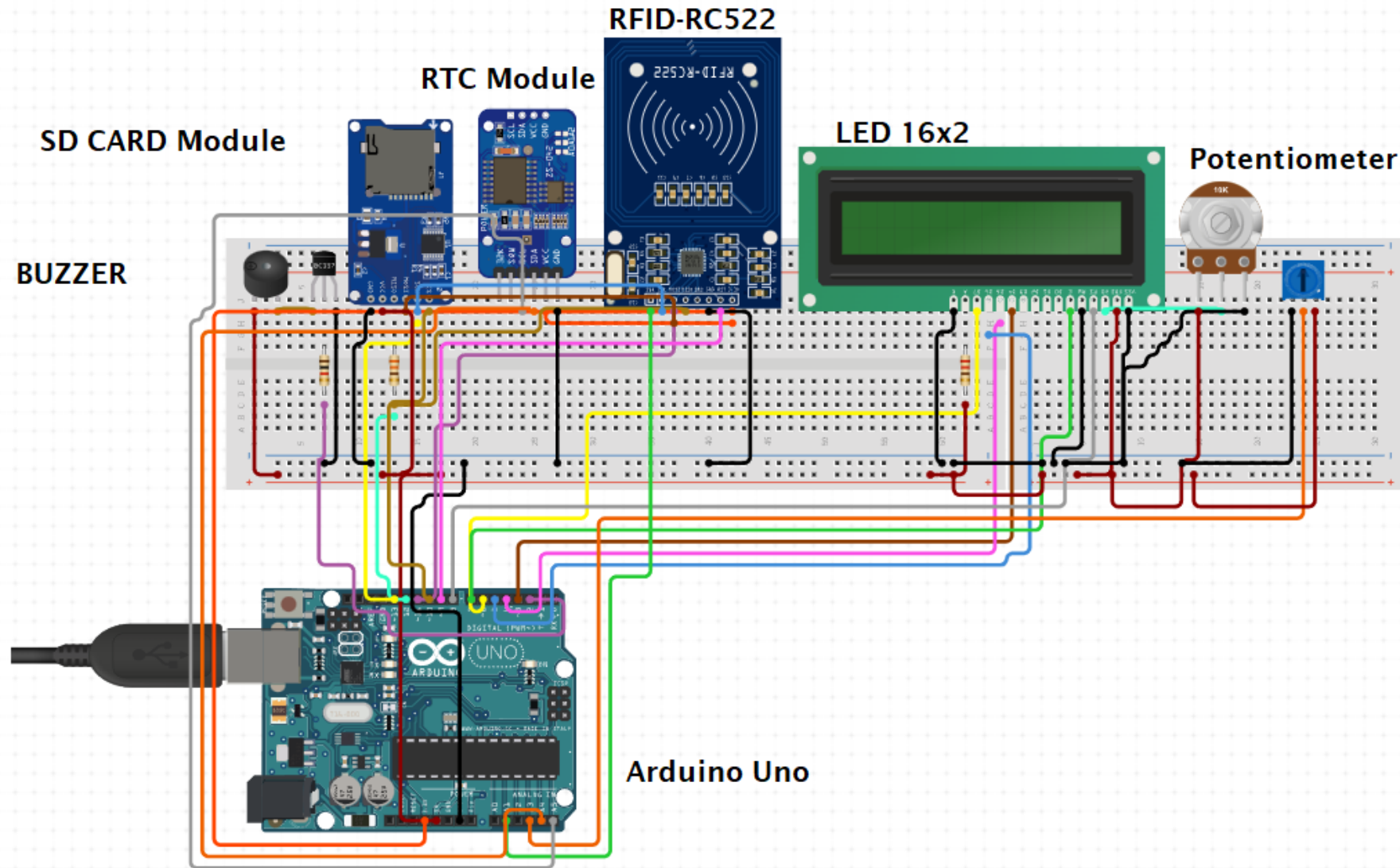
SIMULATION

- We are simulating the project in Proteus Software.

- Since RFID Library does not exist for proteus as of now, so we are using two virtual terminals as a substitute to RFID Modules and RFID Tags.

- Arduino IDE is used for compiling the code.

- There is some time gap given between scanning of two ID's during simulation.

- Simulation works on nominal system requirements.

COMPONENTS USED IN PROTEUS

- SIMULINO UNO

- VIRTUAL TERMINALS

- JUMPER WIRES

- DS1307 RTC

- QUARTZ CRYSTAL – USED WITH RTC

- LCD DISPLAY 16x2

- SD CARD MODULE

SIMULATION CONNECTIONS

- We are connecting all the components to the Arduino board.

- SD CARD is connected to pin 10, 11, 12, 13 of the Arduino board.

- Virtual Terminals are connected to pins RX and TX of the Arduino board. One is used for taking the input and one is used for giving the output.

- DS1307 RTC is connected to A4 and A5 of the analog input of the Arduino board.

- LCD pins are connected to the required pins of the Arduino board for displaying the time.

PROTEUS CIRCUIT IMAGE
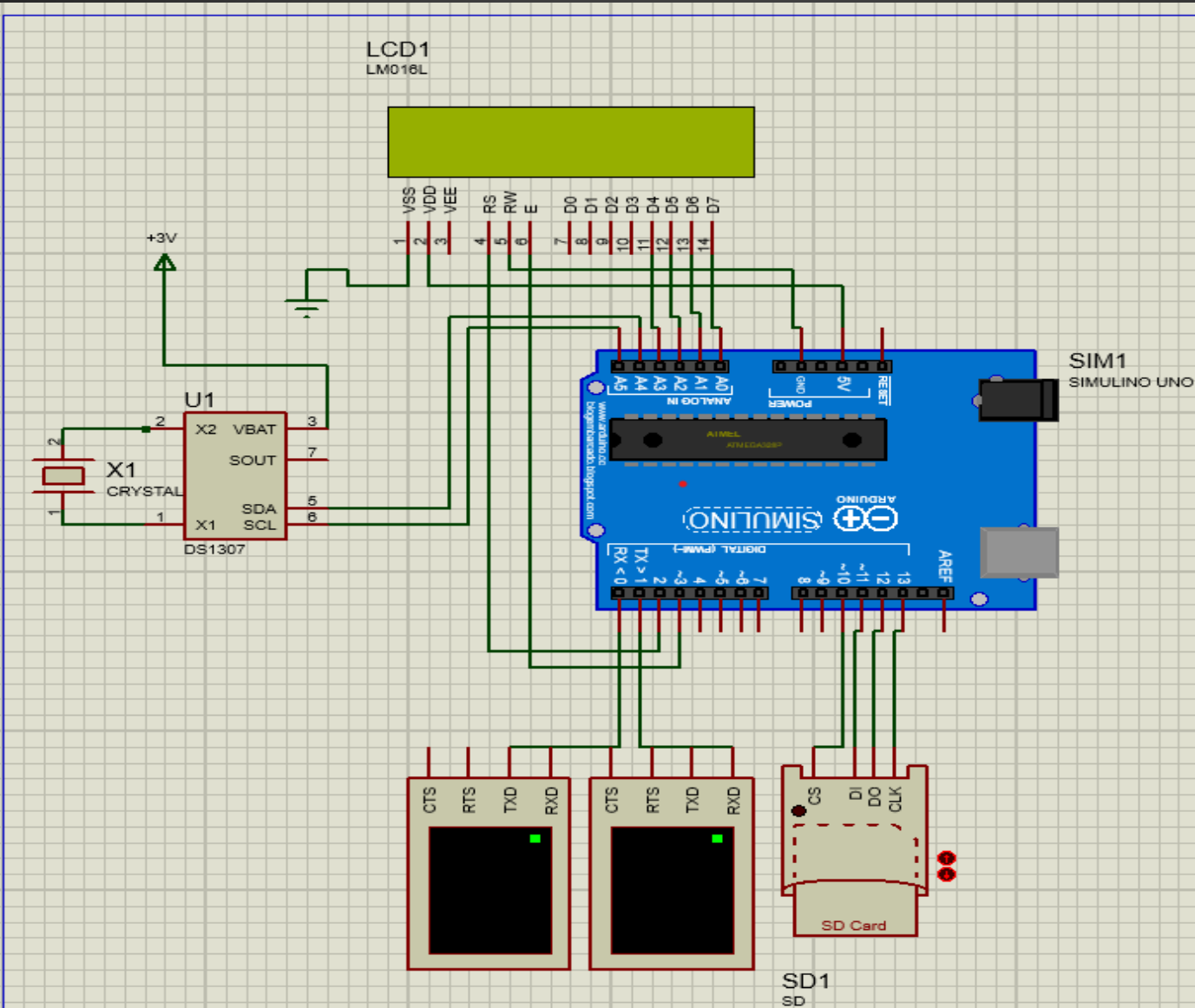
SIMULATION PROCESS

- When we run the simulation a LCD starts and it displays the current time of this region.

- Both the virtual terminals starts and the terminal which we have taken for output displays the message to scan the rfid, where we will enter the HEX id which we have created.

- SD Card module will simulate the virtual SD card reader for us. A image file is used as a SD card in the simulation. This virtual image of SD card in our module can be used for logging the attendance data.

SIMUALTION PROCESS(CONT.)

- When we will give input of the tag id and if it is correct then it will get stored inside the file "Log.txt" created in the SD card by the SD card module and LCD displays "Attendance done", if it is incorrect then it does not get stored in the SD card.

- The data logged in the file of the SD card can be seen as that file can be accessed with the help third party software like "WINIMAGE" which we have used in our project which helps us to access the virtual SD card created and we can access the "Log.txt" and can do general operations.

DIFFERENCE BETWEEN HARDWARE SIMUALTION AND SIMULATION ON PROTEUS

- Hardware simulation can be done using the RFID Module and RFID Tag where the connection can be established between the RFID module and Arduino and whenever a valid tags gets scanned it can log the data in the SD card which we have inserted in the SD card module which we have added to Arduino. Where as in the proteus we have used the virtual terminals to do the work of RFID due to limitations of the proteus software mentioned above.

- User can take out the card and access it using pc and store the data in the database. Here the virtual SD card is there which stores the data and do all this work. This can be also be accessed and read.

APPLICATIONS IN REAL LIFE

- This system can be used in schools and colleges as the attendance system there.

- It can be used in organizations for marking the attendance of employees. Their entry and exit time can be recorded.

- We can use it as an authentication system with the automated door locking system that is if the Card Id is valid then the person can go inside the door, we have also seen this in some places.

- Can be used in small businesses such as shops and vendors to check when the employee is leaving and coming.

SUMMARY

- Created a attendance system with the help of microcontroller which is RFID and Arduino board which can be used to mark attendance of the workers/students.

- RTC Module, SD CARD Module and LCD are components used, RTC keeps track of time, LCD displays information and SD Card logs the data.

- Working is simple and is based on the connection signal between RFID and its tags and then the data processing is handled by Arduino.