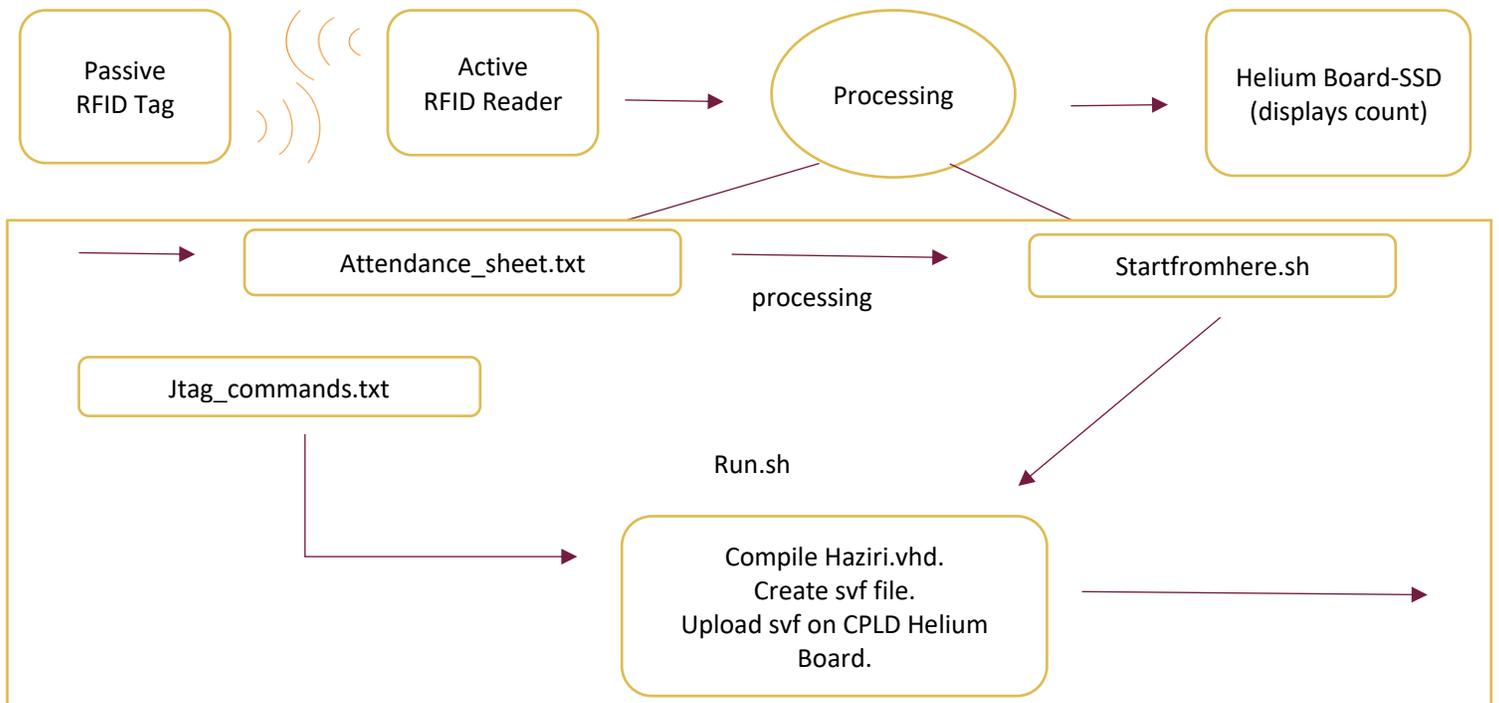# PROJECT PEHREDAAR

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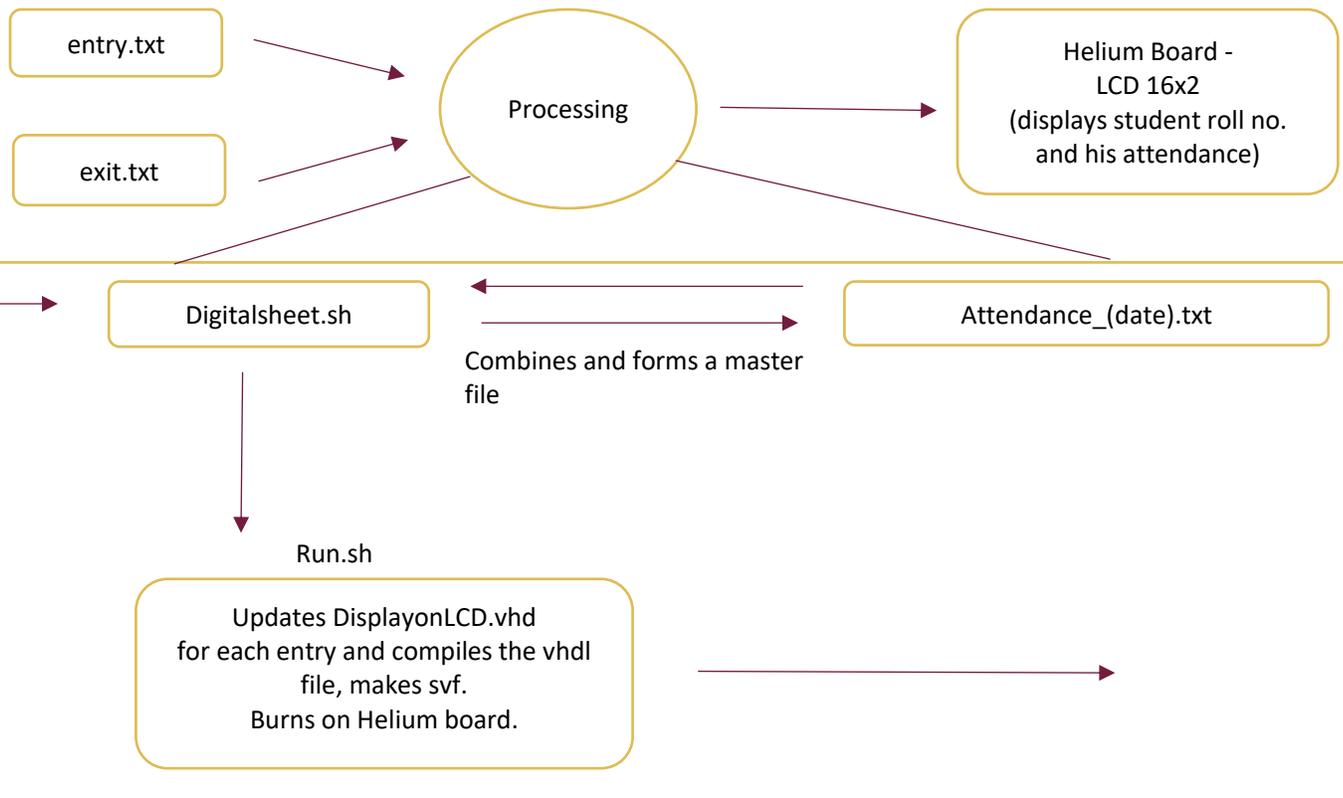SUNIL KUMAR JONWAL (160020010, sunil.jonwal.16002@iitgoa.ac.in)

Introduction

RFID is a technology that is known to human for years but it's use in daily life is still a daydream. _Our team, with our Project have made an attempt to bring this technology one step nearer to daily use._ If you ever went to a big supermarket you must have noticed that if someone tries to take away some item without paying for it, a Siren triggers when he passes through any of the exit gate. How did the gate know that the person has not paid for an item in his cart? The technology behind this is RFID, the same technology which we have used in our project. RFID stands for Radio Frequency Identification. The main advantage of RFID is that it is _not a Line of Sight Technology_ i.e. One doesn't require to be in straight line to the machine to use it. Barcode is an example of Line of Sight Technology.

The main aim of our Project is to create an efficient, cost effective and automatic Tracking System. Also, to give a thought to students to think further uses of this in day to day life. In the current system we are tracking the attendance of Students for each lecture. In our system, each student will have a passive (no battery or cell attached) _RFID tag attached to his ID Card_. The door of each lecture hall will be equipped with an Active (uses energy and also transfers energy to the tag) RFID Reader. Whenever a student (having his ID card with him) attends the whole lecture, only then his attendance is marked for that lecture. This way we can _solve the problem of manual attendance and can save time_. It's not like Barcode that we need to scan our card daily before entering the hall (Here Not being a Line of Sight Technology is useful). With this technology, nothing is changed. Only students require to keep his ID card with him during lecture.

System overview

```
entry.txt ──────────►
                        ┌──────────┐              ┌─────────────────────────┐
exit.txt  ──────────►   │Processing│ ──────────►  │   Helium Board -        │
                        └──────────┘              │   LCD 16x2              │
                                                  │ (displays student roll no.│
                                                  │   and his attendance)   │
```

┌──┐
│ ──────► Digitalsheet.sh   ◄────────────   Attendance_(date).txt   │
│   ───────────►   │
│   Combines and forms a master   │
│   file   │
│   │
│   Run.sh   │
│   ┌────────────────────────┐   │
│   │ Updates DisplayonLCD.vhd│   │
│   │ for each entry and compiles the vhdl   │
│   │ file, makes svf.   │ ──────────────────►   │
│   │ Burns on Helium board. │   │
│   └────────────────────────┘   │
└──┘

Implementation Details

Our system is an amalgamation of C++, Linux utilities (bash script, sed, awk etc.), Sublime Text Package, VHDL, Quartus Command Line Arguments, CPLD Board (Helium Board) and JTAG.

Interval I1: - [lecture start time - 10, lecture start time + 10]
Interval I2: - [lecture end time - 10, lecture end time + 10]
For E.g. if a lecture starts at 8:35 AM and ends at 10:55 AM, I1 = [8:25,8:45] and I2 = [10:45,11:05].

How data reaches to our computer? (! Layman Terms!)
RFID consists of three components: RFID tag, RFID Reader and an antenna. RFID tag has a chip which encodes the information about the chip (unique id). The one we are using is non-writable but tags on which information can be written are available in market and using that we can encode the complete information about the object to which this tag will be attached. Nevertheless, our system is good enough with the unique id info. We are using passive RFID tag that means it requires no battery or cell to work. It has an antenna. Whenever RFID tag comes in proximity of RFID Reader, it gets "activated". RFID reader radiate radio waves all the time. The RFID tag receives this waves through antenna and then stores the energy provided by these waves. It then reads the information stored in its chip and transmits back the information to the reader using this energy. RFID Reader receives this information and transfers this to the Memory element (in our case PC) through serial communication (USB).

How frequent data is recorded?
As we are implementing system for marking attendance, so the main thing we needed to avoid was late attendance and proxies. To do this, we implemented the following idea-> We marked the attendance twice: At the start of lecture and at the end of the lecture. The system was *marking attendance for a certain time period* in two cases during interval I1 and interval I2. It also removes duplication if any. During the lecture, it stops marking attendance, so if anyone reaches 50 - 60 minutes after lecture begin time, his attendance is not marked.

What happens to information when it is received?
What we receive is the Unique ID of the tag. In PC, the file Attendance_Sheet.txt is opened in Sublime Text (Why Sublime Text? We use a package [AutoSave] of Sublime text which saves a file automatically whenever a change in file is made.) and

remains focused while marking of attendance is on. We have StartFromHere.sh bash script running on the back hand which keeps an eye on the Attendance_Sheet.txt file. It does something every 25 seconds till marking of attendance is over. What it does is that on each 25 second it checks the file, removes the duplicate entries and then counts the total new Entries from the last time (25 second). It then updates the Haziri.vhd file with this new entries' count and also the number of students before this new entry and then runs the RUN.sh file. At the end of first time attendance a file "entry.txt" is created which stores the information of tags that were marked in interval I1. Similar goes with "exit.txt" which stores information of tags that were marked in interval I2.

What RUN.sh does?
It compiles the "Tracking_System" Project (with file "Haziri.vhd") and then creates an SVF file "DisplayOnSSD.svf". All this is done using the Command Line Arguments of Quartus. We have a file "CommandLine_Quartus.txt" which contains command line arguments of Quartus for Reference. After that it uploads the SVF file on the CPLD board by running JTAG Commands. *JTAG doesn't have any built in Command line arguments and hence we used Linux utilities to perform this task.*

What Helium Board Displays (SSD)?
It shows increment to the previous number up to the number of new Entries. On Each Rising Clock Edge, the shown number is incremented by 1 and displayed. We display 4-digit Decimal Number using Seven Segment Display with the help of Multiplexing.

What Next?
After the attendance marking is over for the lecture, we have another bash script "Digital_Sheet.sh" which can be run if required. What it does it, it takes "entry.txt" and "exit.txt" and find common entries in both. It then creates an Attendance Sheet for the given day with the entries like

Roll No.	Unique Tag ID	Present/Absent
160010001	XXXXX	PRESENT
160010002	YYYYY	ABSENT
160010003	ZZZZZ	PRESENT
-	-	-
-	-	-

The student is marked present only if his entry is present in both "entry.txt" and "exit.txt" file. Bash Script then loops over this new Sheet one entry at a time and changes the Roll No and "PRESENT/ABSENT" in the vhd file("Display_On_LCD.vhd") for this entry and then runs the RUN.sh file. Waits for 25 second after each iteration.

What RUN.sh does?
It compiles the "Digital_Attendance_Sheet" Project (with file "Display_On_LCD.vhd") and then creates an SVF file "DisplayOnLCD.svf". All this is done using the Command Line Arguments of Quartus.

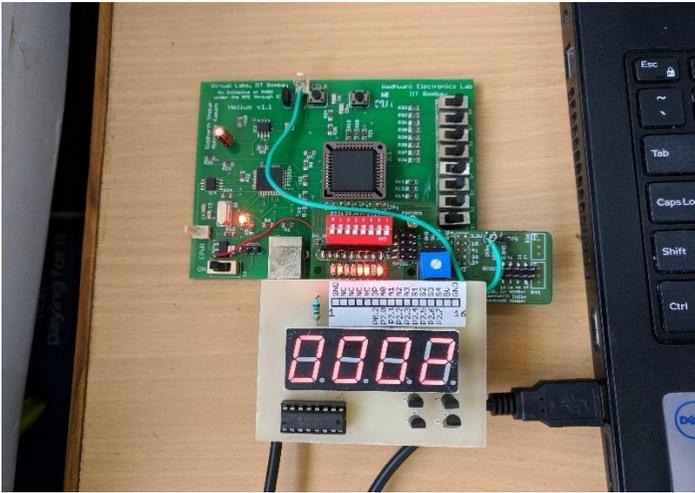*What Helium Board Displays (LCD)?*
Liquid Crystal Display(LCD) on the CPLD Board *shows the Roll No on the first line and PRESENT/ABSENT on the second line*. In this way, entry for each student enrolled for the course is shown on the *Display one by one in increasing order of Roll No.*

Results

We have successfully made the attendance system automated according to our proposal which doesn't need any human interaction. This will make both the teacher's and student's lives easier. *We may also implement our project on a bigger scale in IIT Goa.*
So, *we have successfully completed everything from our project proposal* except the part of making our own RFID Tags.
We had studied the construction from net but were not able to make them due to lack of one component.

Here are some photographs of our complete project:

Conclusion

Nothing becomes perfect in the first attempt. Same goes with our system, there are certain flaws in it but with aid of other technology these can be removed. We may also be able to remove the need of a computer in between by using some less expensive memory elements.

Our project is not bounded only to automatic attendance system, it can be used for more tracking systems. For E.g., we can implement this technology *in automatic inventory registering systems* in labs or library, in which if someone takes something without informing anyone then it will automatically be issued against his name in the register using RFID technology.

So, to conclude this technology has vast implications and we have only touched one such use.