

Development of an NFC-based Attendance and Location Logging System Using an Online Scheduling SQL Database for PSHS-MC Batch 2018

ABSTRACT

An NFC-based card reading station and an online Batch 2018 student schedule SQL database were developed to address the inconsistency and inefficiency of traditional attendance checking methods as well as to promote the accessibility and convenience of schedule and attendance data collection. For the NFC Station, a Radio Frequency Identification (RFID) / Near-Field Communication (NFC) reader, a WIFI module, and a touchscreen module were used. These work with an Arduino Microcontroller and Raspberry Pi Computer to accurately read the tags on RFID cards and to upload attendance data to the online database respectively (Aydin, Coskun, Ok, & Ozdenizci, 2011). For the online database, data on each individual person, schedule, venue, and class meeting were collected, compiled, and inserted into a MySQL database in tables. The user interface forms were then written in PHP using CodeIgniter as a framework (Upton, 2007). Using the online interface, users are able to identify all class meetings active during any given time period in a day, as well as all students enrolled in a class. Additionally, a user can view the currently attended class and venue, as well as the full weekly schedule of a selected student. Using the information collected for the database, analysis of Batch 2018 students' schedule data was carried out, to identify class trends in order to improve the implementation of the Specialization Years Curriculum. This meant that the core, elective and math level distribution of Batch 2018 students were graphed and compared with respect with each other. The next phase of the study will be to integrate the NFC station with the database to upload attendance data upon scanning RFID cards (Balamurugan, Chakravarthi, & Ruttala, 2015). This will then be used to configure student location tracking and generate automatic yearly attendance reports.

BACKGROUND

- ❖ Lack of school digitization
- ❖ Difficulty in on-campus student location
- ❖ Flaws in class-planning and distribution
- ❖ Inconvenience in accessing school schedules

OBJECTIVES

- ❖ To construct an NFC card reading station
- ❖ To create student schedule database with web-accessible user interface using MySQL & PHP
- ❖ To integrate the NFC system with the online database
- ❖ To assess the accuracy and efficiency of the NFC system

SIGNIFICANCE

- ❖ Complete digitalization of school system
- ❖ Ease of student or faculty tracking and location
- ❖ Analysis and improvement of class planning and schedule construction
- ❖ Accessibility and convenience of schedule data

METHODOLOGY

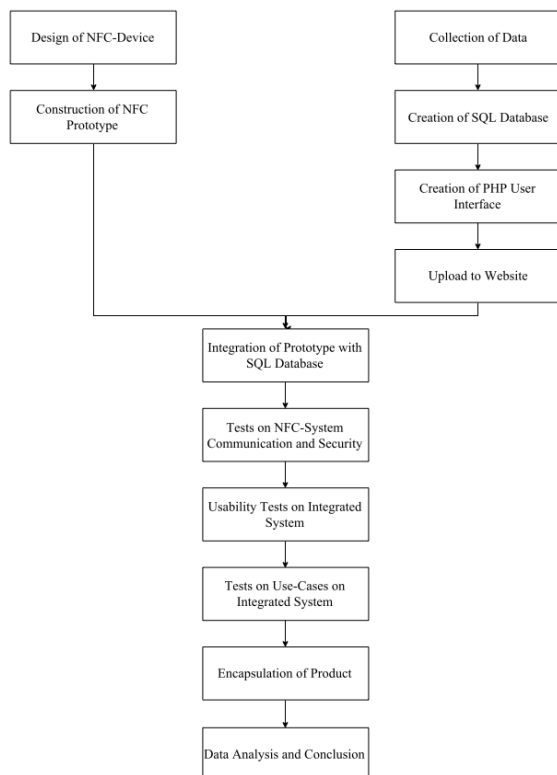


Figure 1. Process Flowchart

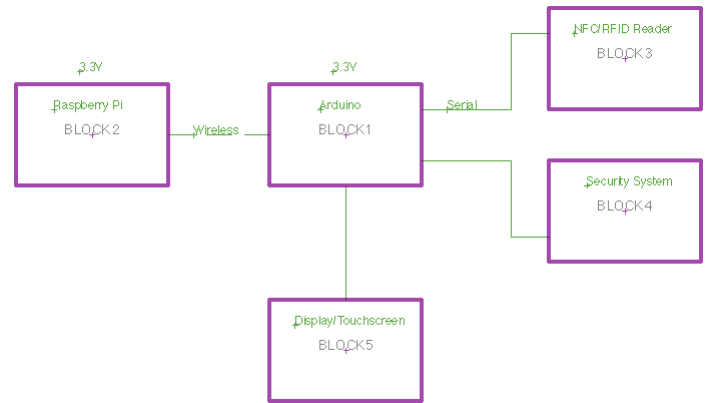


Figure 2. Final Complete Block Diagram

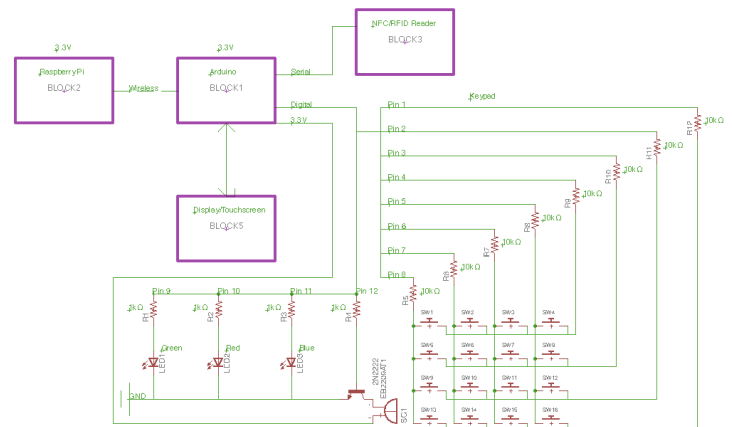


Figure 3. Final Complete Circuit Diagram

RESULTS AND DISCUSSION

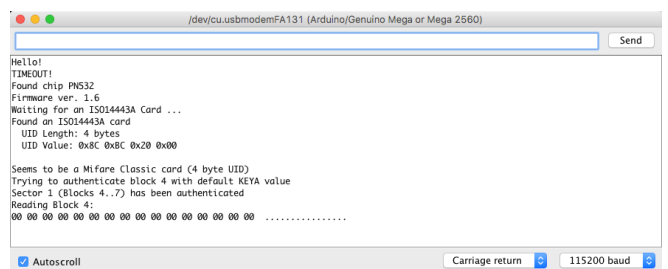


Figure 4. NFC Scanner Serial Monitor Success Display

As seen in Figure 4, the NFC/RFID scanner module was successfully integrated with the Arduino IDE through the use of the *Adafruit_PN532* library. Code snippets were taken and adapted for the NFC station.

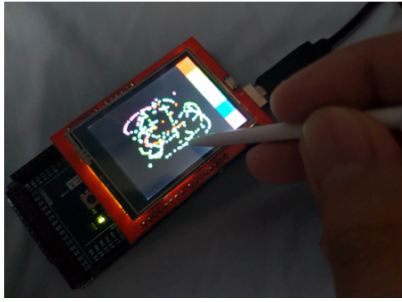


Figure 5. TFT LCD Touchscreen Module Successful Integration

Figure 5 shows the TFT LCD Touchscreen Module successfully integrated with the Arduino IDE using the *Adafruit_GFX* and *Adafruit_TFTLCD* libraries. Code snippets were taken and adapted for the NFC station.

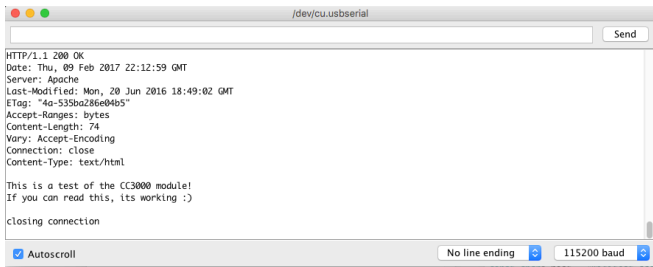


Figure 6. ESP2866 WIFI Module Serial Monitor Success Display

Figure 6 shows the ESP2866 WIFI Module successfully integrated with the Arduino IDE using the *esp2866* board driver. Code snippets were taken and adapted for the station.

classmeetingid	classid	1	name	num	section	day	start	end	type
1	1	CS	5	edge	1	09:40:00	10:35:00	1	
2	1	CS	5	edge	3	10:35:00	13:20:00	2	
3	1	CS	5	edge	5	09:40:00	10:35:00	1	

Figure 7. Snippet of Completed SQL Database

As seen in Figure 7, each of the weekly meetings for each specific class are listed in the SQL database, including the start and end times, whether the meeting is a lecture or lab, class ID, as well as the specific meeting ID.

MON 1	TUE 1	WED 1	THU 1	FRI 1
MON 2	TUE 2	WED 2	THU 2	FRI 2
MON 3	TUE 3	WED 3	THU 3	FRI 3
MON 4	TUE 4	WED 4	THU 4	FRI 4
MON 5	TUE 5	WED 5	THU 5	FRI 5
MON 6	TUE 6	WED 6	THU 6	FRI 6
MON 7	TUE 7	WED 7	THU 7	FRI 7
MON 8	TUE 8	WED 8	THU 8	FRI 8
MON 9	TUE 9	WED 9	THU 9	FRI 9

Meetings happening during **MON 1** are:

- LECTURE: BIO 3.2 Azure ----> SHB107
- LECTURE: PHYS 3.2 Anode ----> ASTB302
- LECTURE: SOC SCI 5 Capital ----> SHB320
- LECTURE: FIL 5 Agta ----> SHB309
- LECTURE: FIL 5 Batak ----> SHB301
- LECTURE: ENG 5 Delta ----> SHB306
- LECTURE: RES 2 Heinrich ----> SHB113A

Figure 8. Schedule and Time Period View of Particular Time Period (Monday 1)

Figure 8 shows the Main Schedule PHP controller, which allows a user to click on the 45 available weekly time periods to view all classes during that time, as well as their respective campus venues.

Schedule of **KIM, JOSHUA KYLE SUN-MYUNG C.**

SOC SCI 5 Capital	FIL 5 Cuyonon	SOC SCI 5 Capital	SOC SCI 5 Capital	FIL 5 Cuyonon
ENG 5 Charlie	ENG 5 Charlie	FIL 5 Cuyonon	ENG 5 Charlie	MATH 5.1 Centroid
CS 5 edge		MATH 5.1 Centroid		CS 5 edge
	MATH 5.1 Centroid	CS 5 edge		RES 2 Ernst
		CS 5 edge		
		CS 5 edge	PHYS 3.2 Coulomb	
PHYS 3.2 Coulomb				PHYS 3.2 Coulomb
RES 2 Ernst				PHYS 3.2 Coulomb
		RES 2 Ernst		PHYS 3.2 Coulomb

It is now: **WED, 11:00**
 Currently Attending **CS 5 edge** (10:35:00-13:20:00)
 at ----> **ASTB101B**
[Back to MAIN SCHED](#)

Figure 9. Schedule View and Current Status of a Batch 2018 Student

Figure 9 shows the Student Schedule PHP controller, which allows a user to view the complete schedule of a selected student, as well the class they are currently attending, along with its respective campus venue, depending on the current time and day. Each of the student's classes can be selected to display its respective full class list.

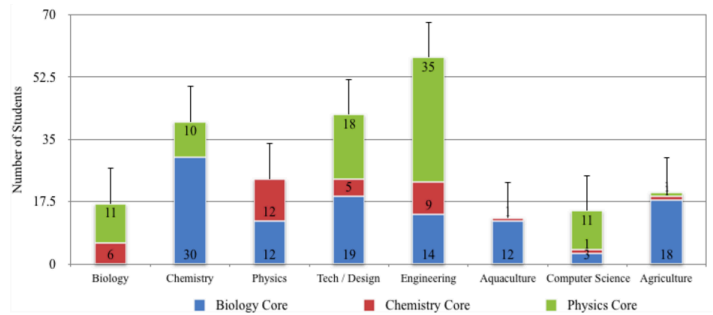


Figure 10. Distribution of Core & Elective Classes in Batch 2018 (S.Y. 2016-17)

Figure 10 shows the distribution of core classes among Batch 2018 students with respect to their elective subject. The data trends gathered will be uploaded to the website and analyzed further and schedules in proceeding years will be suggested in order to account for commonly chosen core and elective pairings.

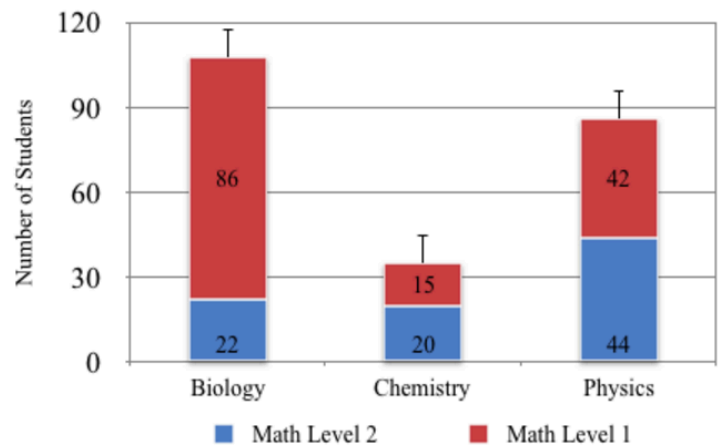


Figure 11. Distribution of Core and Math Classes in Batch 2018 (S.Y. 2016-17)

Figure 11 shows the math level (1 or 2) of Batch 2018 students with respect to their core classes. Similarly, this is to account for commonly chosen core and math level pairings. This information will likewise be uploaded to the website and schedules taking into account common math and core pairings will also be suggested.

CONCLUSION

Through testing, it was found that the online system is effective at interpreting data and properly displaying class meetings or students depending on the user's preference. All of the main modules of the NFC station are completely functional and can effectively scan RFID tags.

RECOMMENDATION:

Further studies should focus on improving the security of the system by implementing a finger scanner for each NFC station.

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