

SURIGAO DEL SUR STATE UNIVERSITY, CANTILAN CAMPUS GATE SECURITY SYSTEM UTILIZING RADIO FREQUENCY IDENTIFICATION (RFID) TECHNOLOGY

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ABSTRACT: *This research developed a computer-interfaced gate security system for Surigao del Sur State University, Cantilan Campus (SDSSU-Cantilan Campus) using PC-linked contactless smart card reader/writer and reader based on radio frequency identification (RFID), which conducts campus gate control by the identification process constructed by the database. The RFID reader recognizes RFID cards issued to students of SDSSU-Cantilan Campus vis-à-vis the PC-interfaced database which identifies the card holders information upon tapping the RFID card into the RFID reader.*

Keywords: RFID, radio frequency identification, smart card reader, gate security

1. INTRODUCTION

Security is one of the primary concerns of every educational institution. Keeping the students, faculty and staff safe is one of the primordial concerns of the school administration. The same holds true for SDSSU-Cantilan Campus.

Due to the significant number of students of SDSSU-Cantilan Campus, the campus security guards can no longer ensure that those who enter the campus are only those authorized to do so due to the nearly impossible task of being able to identify and recognize all the students of SDSSU-Cantilan Campus. Thus, the need for a technology-based gate security system which ensures identification and recognition of the students.

Today, Radio Frequency Identification (RFID) technology is widely used in every industry in automating their process as well as securing their facilities and information. This technology can help the school in addressing the security and access problems that it currently faces. RFID belongs to the family of Automatic Identification and Data Capture (AIDC). AIDC methods automatically identify objects, collect data about them and enter those data into computer systems with little or no human intervention.

Radio Frequency Identification utilizes radio waves to accomplish the AIDC methods. RFID system is consisting of three components: An RFID reader, RFID tag, and antenna. RFID tags contain an integrated circuit and an antenna, which sends data to the RFID reader. The readers then collect the data and transfer it to a host computer system and process it for the system use.

A Radio Frequency Identification (RFID) system consists of one or more tags (or transponders) that store data and transfer the data to one or more readers (or interrogators) over a wireless interface. In practical RFID systems the readers are networked to a wider enterprise computer system. The main function of an RFID system is to enable tagged items or persons to automatically state their identity to other systems wirelessly. Like most of today's technologies that are based on cutting-edge research, RFID technology is both very promising and controversial. As a result this technology is

Rapidly expanding in some areas, while in other areas it has failed to make significant headway thus far. Advances in RFID technology are dependent on contributions from many areas such as: device physics and molecular electronics for fabrication, electromagnetic field theory for device operations, mathematics and computer science for data processing and security, and operations research for supply chain management.

This project design uses RFID technology and focuses on identifying students and acts as access card for the campus gate.

STATEMENT OF THE PROBLEM

This gate security system is designed with the purpose of addressing the problems below:

- Lack of sufficient campus security;
- Lack of system that controls the entry of people into the campus;
- Lack of an integrated and automated identification system that would validate the people entering the campus premises.

2. RESEARCH METHODOLOGY

To gather the necessary data, the researcher utilized the descriptive method and information through questionnaires and follow-up interviews from students, faculty and staff.

Research Environment

The research was conducted within the Surigao del Sur State University, Cantilan Campus ("SDSSU-Cantilan Campus"). The campus is situated in Brgy. Pag-antayan, Cantilan, Surigao del Sur.

SDSSU-Cantilan Campus is a higher public institution which offers different degree courses specializing in teacher education, food technology, civil technology, automotive, mechanical technology, computer sciences, engineering, management and business administration.

Research Respondents

The respondents of the study are the faculty, staff and students of SDSSU-Cantilan Campus.

Research Instruments

The researcher utilized a researcher-made questionnaire and an interview schedule.

The questionnaires were given to the research respondent containing simple yes or no questions regards the respondents’ perception of the current security system of the campus and their willingness to adapt a new system. The final question in the questionnaire allows the respondents to rate the security system of the capus.

The interview schedule was used to augment the data that was obtained utilizing the questionnaires. A series of interview sessions was conducted with the respondents.

TECHNICAL ASPECTS OF THE SYSTEM



Figure 1.0 Components Diagram

The RFID card acts as a campus ID and should be tapped into the RFID reader. The RFID reader will then transmit the signal to a computer which will utilize and process the date on the RFID card. The Computer will display the RFID card ID holder’s information on the screen.

System Development Cycle

The waterfall model, a sequential software development process, in which progress is seen as flowing steadily downwards (like a waterfall) through the phases of Conception, Initiation, Analysis, Design (validation), Construction, Testing and Maintenance, was utilized by the researcher in developing the software in this study.

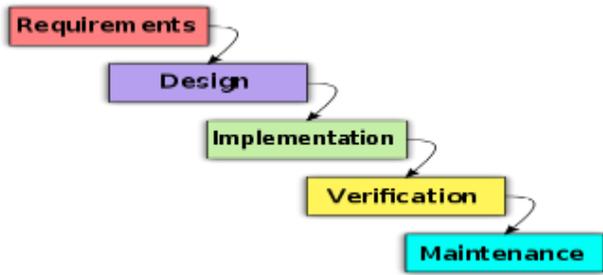


Figure 2.0 Schematic Illustration of the Waterfall Model

A. Requirements

- a. Software
 - i. Any Windows Operating System
 - ii. MS Access 2007
 - iii. NFC Drivers and SDK
- b. Hardware
 - i. ACR 122u USB NFC Reader
 - 1. USB 2.0 Full Speed Interface
 - 2. CCID Compliance
 - 3. Smart Card Reader
 - Read/write speed up to 424 kbps

- Built-in antenna for contactless tag access, with card reading distance of up to 50mm (depending on tag type)
 - Supports ISO 14443 Type A and B cards, Mifare, FeliCa, and all 4 types of NFC (ISO/IEC 18092) tags
 - Built-in anti-collision feature (only 1 tag is accessed at any time)
- ii. Personal Computer (minimum)
 - 1. Core i3, 2.4 ghz
 - 2. 2gb RAM
 - 3. 500 GB Hard Drive
 - 4. Mouse (Optical)
 - 5. Keyboard
 - iii. Turnstile
 - 1. Battery, 12V
 - 2. Relay, 12v, 3A

B. Design

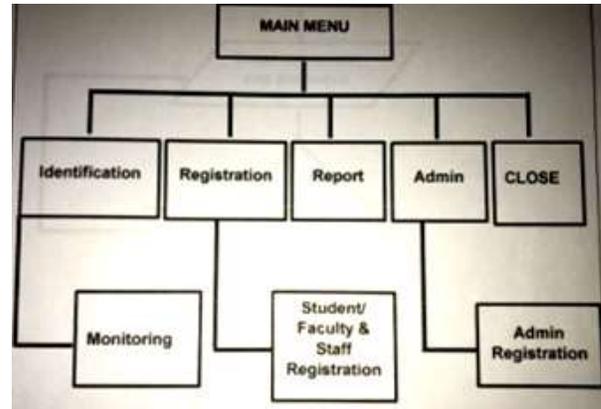


Figure 3.0 Menu Hierarchy

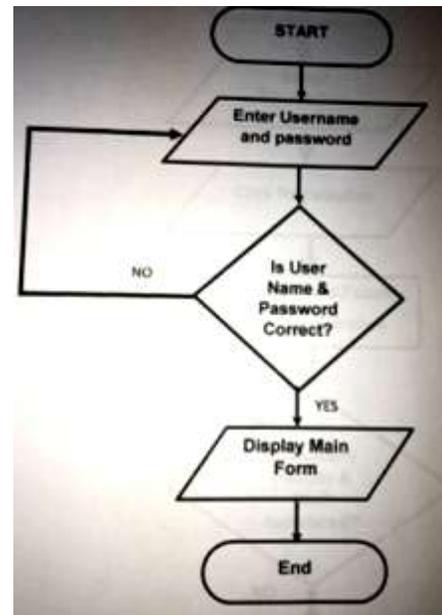


Figure 4.0 User Log-in Flow

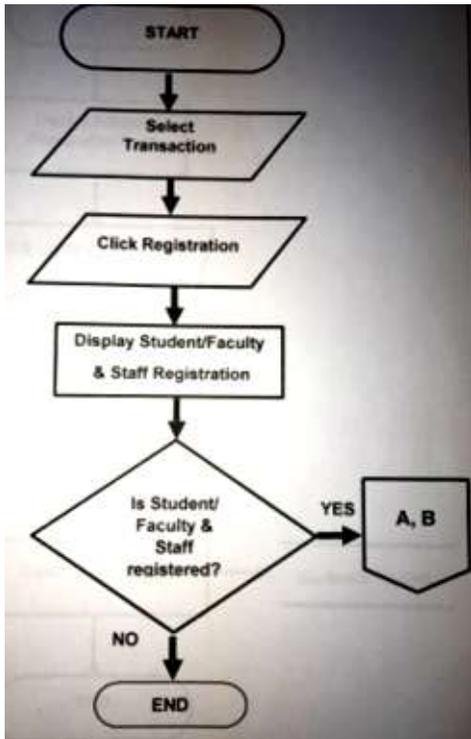


Figure 5.0 Registration Flow

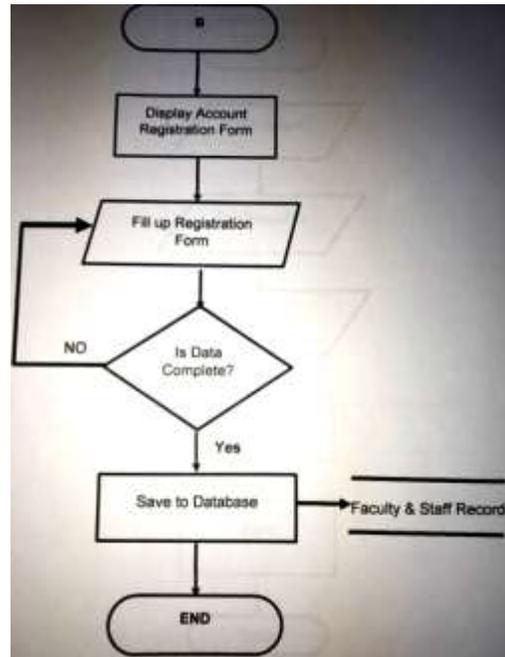


Figure 7.0 Faculty & Staff Registration Flow

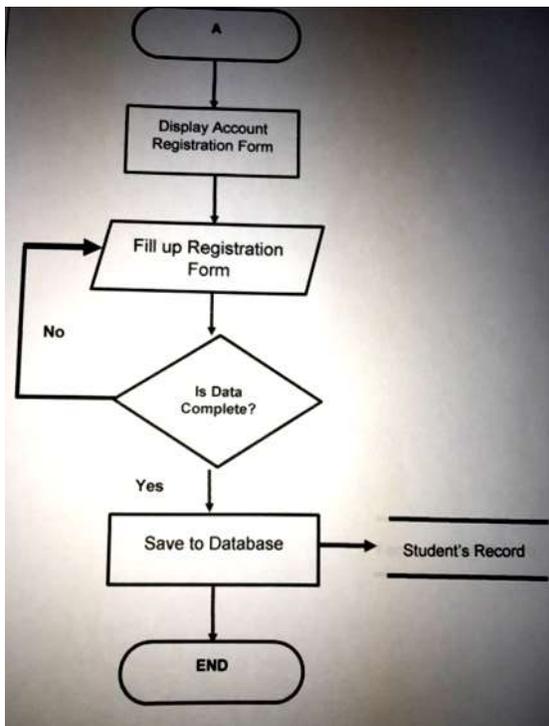


Figure 6.0 Student Registration Flow

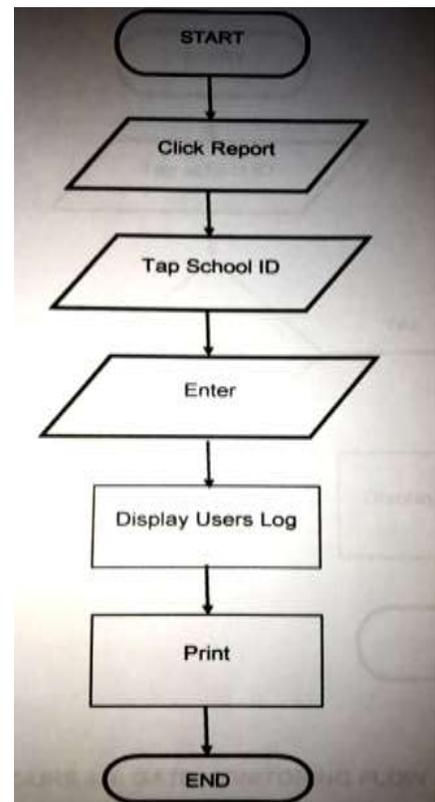


Figure 8.0 Report Flow

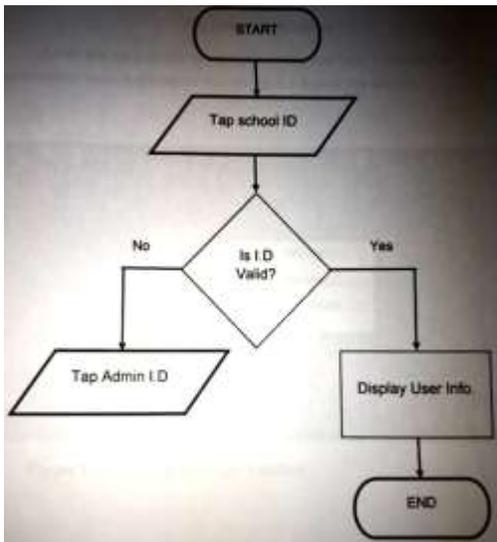


Figure 9.0 Gate Monitoring Flow

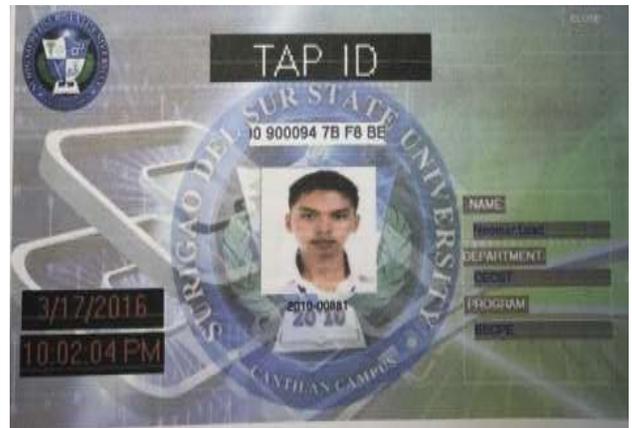


Figure 12.0 Identification interface

C. Implementation

Below are the screenshots of the system's interface. It covers the administrator login, registration, monitoring and logs of the system.



Figure 10.0 Administrator Login interface



Figure 13.0 Registration interface



11.0 Main Menu

The screenshot shows a 'Sample Log report' window. It displays a table with columns for 'DATE', 'TIME', 'USER NAME', and 'IP ADDRESS'. The table contains multiple rows of log entries. Above the table, there are search filters for 'ENABLE AN QUERY WITH DATE' and 'LOGGED FROM'. A 'PRINT LOG' button is at the bottom.

Figure 14.0 Sample Log report

D. Verification

The system shows that it is effective in adding security to the campus premises by aiding in the control of the crowd upon entrance to the school. The security guard

can then quickly identify the RFID card holder's information as it is readily displayed in the computer monitor upon swiping through the card reader. Thus, only those registered in the database will be able to enter the school premises. The system also records the login and logout times of the RFID card holders and may be printed out if deemed necessary for verification purposes.

E. Maintenance

The system can be maintained by the school administrator or a qualified technician. It can be improved or revised to address feedbacks, issues or concerns of the users.

3. RESULTS AND DISCUSSION

After the data were gathered, tabulated, analyzed and interpreted, the researcher obtained the following findings:

- a. 86% of the respondents are willing to adapt another security management system in the campus;
- b. 64% of the respondents answered that the security guards regularly check their ID cards;
- c. 40% of the respondents feel satisfied of the ID system of the campus;
- d. 28% of the respondents feel that their entrance is sufficiently monitored by the school;
- e. 32% of the respondents find themselves secure inside the campus; and
- f. The respondents rated the security system of the campus as follows:
 - Very satisfactory – 16%
 - Satisfactory – 44%
 - Good - 40%

4. CONCLUSION

Findings

In the design of the Gate Security System using RFID Technology, only people who are registered in the database can enter the school premises. It is a PC-interfaced system that uses a RFID technology and turnstile that controls the crowd entering the school premises. The security guard can then easily identify those who are wearing fake or counterfeit ID's as the monitor displays the RFID Card ID holder's

information so that the security guard may easily verify the same.

The researcher was able to build a system that addresses the one of the security issues of the campus as well as keep records of entrance and egress to and from the campus.

Recommendations

To attend to the delimitation of the project's prototype, the researcher recommends the enhancement of the RFID reader though the use of a higher range RFID reader and putting a failsafe system for the turnstile. Integrating of the database for the log records can make the transaction of the system much faster/

It is recommended that the school utilize this project design as the primary security measure as it offers reliability in identifying the people entering the campus.

To future researchers, it is recommended to use the RFID technology as their bases for future research and design.

5. REFERENCES

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