Tianxing Wu **IOT project**

**Project plan**

Bachelor’s degree in IT

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# **The smart NFC turnstile system**

The smart turnstile system is a system accepts or declines access requests from users based on booking information on server.

The system was designed partially to address the flow control during the covid-19 epidemic. To pass the turnstile, users must book a time in advance. If there are still available spots for that time slot, the booking will succeed. After that, the server will send a confirmation email to users and grant user with an NFC card (physical or if possible, through mobile apps). The turnstile has an NFC reader. Users with valid NFC cards will be granted with access permission only 5-10 mins before the time booked, otherwise the access request will always be denied even with an NFC card booked.

When passing the turnstile, the user will be requested to take a photo of face and temperature will be measured. If the temperature is higher than a certain threshold the access will be denied, the system will also have a channel for janitor to speak and instruct users how to use it if the help button is pressed.

On the server, there will be a database to store all the information collected by the turnstile(time, time booked, temperature, face image, time exiting the building), which also host a web server to visualize all the data from visitors.

When again exiting from the turnstile, the user needs to swipe the NFC card again. After that, the time exiting the building will also be logged and the NFC card will be no longer valid. If the user stayed in the place 10 mins longer than the time slot booked, they will receive an email notifying them should leave the place as soon as possible when they have their business done.

# Components

The system is composed of a raspberry pi as the turnstile. An NFC reader will be connected to pi to read NFC cards. A camera and screen are installed onto it to take pictures. There will be two sensors used: a digital temperature sensor to collect the temperature data and an IR distance sensor making sure the user stays within a reasonable distance range with the camera.

To simulate the turnstile, there will be a LED or buzzer for access permitted or denied.

All the data management are hosted on a server. The server will provide web services for users to book time, sending emails and it will also serve as a database to store all the visitor information as well as to visualize it to management staff.

Lastly an NFC writer to write information to the NFC card

Optionally there will be a web service to pass an NFC tag with mobile app.

# Team member and responsibilities

The team has only one person, therefore a TODO list with time estimated is be presented here.

* Configure raspberry pi will all the sensors, camera, NFC reader etc.

15 hrs.

* Implement a web service for user to book time slots and pass authentication info.

25 hrs.

* Implement a web service for management staff to visualize the data.

15 hrs.

* Write the authentication information to the NFC card.

3 hrs.

* Establish communication between server and raspberry pi for the booking information, authentication as well as picture and temperature.

15 hrs.

# Hardware manuals

Digital temp: <https://sensorkit.en.joy-it.net/index.php?title=KY-028_Temperature_Sensor_module_(Thermistor)>

IR distance sensor: <https://sensorkit.en.joy-it.net/index.php?title=KY-032_Obstacle-detect_module>

Passive buzzer: <https://www.sunfounder.com/learn/sensor-kit-v2-0-for-raspberry-pi-b-plus/lesson-10-buzzer-module-sensor-kit-v2-0-for-b-plus.html>

NFC reader: <https://www.instructables.com/RFID-RC522-Raspberry-Pi/>

Camera: <https://www.digikey.fi/product-detail/en/raspberry-pi/913-2664/1690-1011-ND/6152810?utm_adgroup=Evaluation%20Boards%20-%20Expansion%20Boards%2C%20Daughter%20Cards&utm_source=google&utm_medium=cpc&utm_campaign=Shopping_Product_Development%20Boards%2C%20Kits%2C%20Programmers&utm_term=&productid=6152810&gclid=CjwKCAiAv4n9BRA9EiwA30WND9_Tc4R9aHtPyjy6iqPnpKMhZXJPdguSYFbPwqOFV9NtgS6gUVqBNxoCjFQQAvD_BwE>

Display: still investigating