Embedded System Lab

Final Project, Spring 2023: Embedded System Laboratory Final Project

1 Objectives

In the final project lab, you get a chance to exercise your knowledge, creativity and management skill to create a contactless device. The project leverages the STM32 microcontroller to read and write sensor data, while the ESP8266 (NodeMCU) acts as the WiFi bridge for the STM32. From there, you can connect to the Internet and create a contactless device! For the IoT communication, you can use any API you would like to use. We recommend NetPIE. You may find some other API like Firebase easier to get start.

For this year, you may pick a project that help relevate issues in Bangkok by implementing a system that would help a Bangkok policy (https://www.chadchart.com/policy/). The projects must use at least 2 two different type of sensors or actuators.

You will also be developing team works skill by working in a group of four. Each one of you must assign yourself to one of the following role: system architecture, front-end development, embedded system development, and UI designer and development.

2 Background

2.1 IoT

The Internet of Things (IoT) is a system of interrelated computing devices with the ability to communicate over a network with or without human interaction. This can be ranged from monitoring biometric or enviroment to human interaction. It has been used in many places from agriculture, health monitoring, home or even in the city scale.

2.2 NETPIE

As state above, you may use other framework.

NECTEC has developed the cloud-based IoT platform-as-a-service named NETPIE (https://netpie.io) and launched the service since September 2015. NETPIE is a cloud platform that interconnects IoT devices together in the most seamless and transparent manner. By moving the complexity of connecting IoT devices from application developers or device manufacturers to the cloud, NETPIE helps shorten development time and reduce burden of server administration.

(This is an assert from https://www.nectec.or.th/en/innovation/service-innovation/netpie.html. Please see the link for more information)

From your point of view, you can connect to NETPIE through NodeMCU. NETPIE already provides a simple interface for connecting NodeMCU to NETPIE. Please see https://netpie.io/ for more details.

Note that there are two versions of NetPIE API. If you look for tutorials online, it may only be applicable to older version of the API.

3 Groups

We expect you to work in groups and each person has a different roles. Here is an example of how the groups may organized.

1. System Architecture - Design and integrated the system
2. Embedded System Development - Develop code on the MCU/ESP32
3. UI/UX Designer and Development - Design and develop user interface
4. Team Management - Manage team to work in the time scale.

Note that you may use a different structure.

4 Requirement and Submission

The tentative date is after the final exam week. Each group must prepare 4 minutes demonstration.

Your application must contains at least the following features:

1. Using communication and some processing between STM32 and NodeMCU
2. Connected to Internet and Cloud System
3. The device is solving or implemting a policy from https://www.chadchart.com/policy/.

Each week, you must submit a short progress report (a paragraph) on MCV.

On the day of submission, you will be prepare the following:

1. 4 minutes presentation describing how your devices behave.
2. At least 4 pages report final project. Each team member must describes at least in one page about their role and responsibility.
3. Source Code: During the course of development, you must use a repository, such as Git, Mercury or SubVersion. The repository must be accessible from the Internet. You must submit the archive of the source code along with the link to repository.