Real-time Hardware Project

*Embedded systems*

Author: Wingren, Jesper

Examiner:Mehdi Saman Azari

Semester: 24HT

Course code: 1DT903

Assignment 2

# **Exercise 1**

En bild som visar text, handskrift, papper

Automatiskt genererad beskrivning

**Exercise 2**

# **En bild som visar text, handskrift, papper, dokument Automatiskt genererad beskrivning**

# **Exercise 3**

To solve exercise 3, I used the following components a raspberry pi pico w, dht11 sensor, button, led and wires. I used and mqtt broker for mqtt communications and datacake for data visualisation.   
It works as following, the raspberry pi starts by connecting to the wifi and to the mqtt broker. After that it subscribes to my led topic making it possible to know when data has been published so it can light up its led. After that the first iteration of the loop starts by doing a measurement of temperature and humidity using the sensor and publishing it to the broker which datacake gets it values from. The datacake has a decoder that takes the info and sets a field to correctly display it in the dashboard. In datacake there is also an encoder that publishes data to the led topic when new data has been published. Here is the encoder, decoder and the dashboard in datacake.

En bild som visar text, skärmbild, nummer, programvara

Automatiskt genererad beskrivningEn bild som visar text, skärmbild, programvara, nummer

Automatiskt genererad beskrivning

En bild som visar text, vit, skärmbild, Teckensnitt

Automatiskt genererad beskrivning

For the main loop it works with a 10 second timer and button interrupt meaning it has a 10 second timer for sending data but when pressing the button it sends data instantly and resets the timer. Here is the full code:



**Discussing the RTOS problem using micropython**

When testing this project, I can clearly see the problem with using micropython instead of an RTOS. For example, when pressing the button there is a waiting time before it actually publishes the data, and it takes time before the led actually lights up. This is because it takes time for the program to first react to the button press then it takes time to publish it and then to react to the publish and light the led. This wouldn’t be any good in a for example medical emergency button if it would take a couple of seconds before it sounds when every second matters. Therefore, RTOS is an important thing in some embedded systems.

**Hardware pictures**

**En bild som visar Elkabel, elektronik, kabel, Elektrisk ingenjörskonst

Automatiskt genererad beskrivningEn bild som visar elektronik, kabel, Elkabel, Elektrisk ingenjörskonst

Automatiskt genererad beskrivning**

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