Faculty of engineering
Ain shams University

Introduction to Embedded Systems

(CSE211s)

GPS-Tracking-System-using-TIVA-C

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Project Description

1. The GPS subsystem stores the coordinates of the start point.

2. After reaching the destination point, the GPS subsystem stores the coordinates

of the end point and calculates the total distance that was taken by the user.

3. The output will be translated as the following.

    1. Stage 1: The built-in LED will be turned on(green) when the target destination is reached.

    2. Stage 2: The built-in LED will be turned on(yellow) when the target destination is about to be reached < 5 meters.

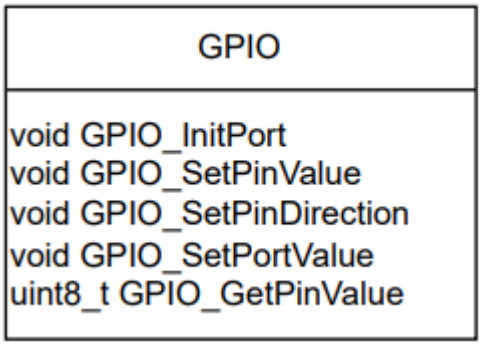
    3. Stage 3: The built-in LED will be turned on(red) when the target destination is far away by distance > 5 meters.

Links:-

-Github repositories: https://github.com/ENGaliyasser/GPS-Tracking-System-using-TIVA-C

-Video: https://drive.google.com/drive/folders/1iVHXKPgMS_PXqJvjQfF0XGWhyf_Pinwc

Modules UML

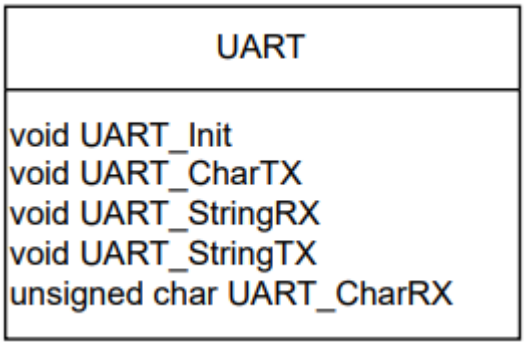


GPIO stands for General Purpose Input/Output, and it refers to a type of interface available on the Tiva C series microcontroller board.

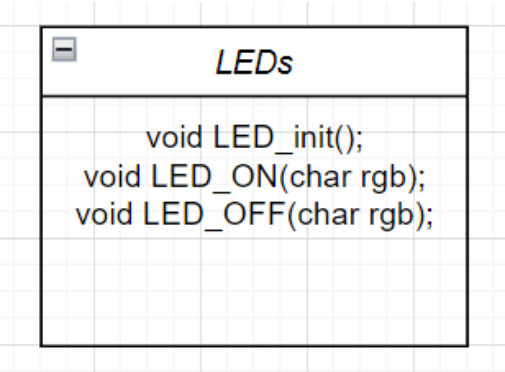
GPIO pins on the Tiva C board can be configured as either inputs or outputs, allowing them to either receive signals from external devices or control signals sent to external devices.

As inputs, GPIO pins can be used to read the state of a button or switch, for example. As outputs, they can be used to control the state of an LED, motor, or other electronic component.

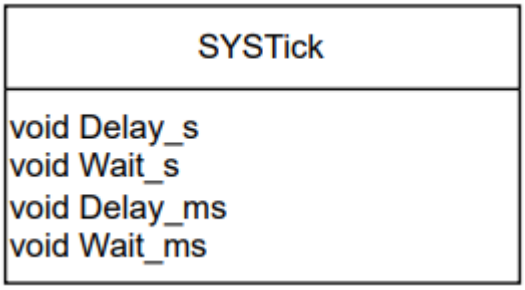
The Tiva C board has a variety of GPIO pins available, each of which can be individually configured for input or output and can be controlled using software commands. GPIO pins are a versatile and widely used feature of microcontroller boards like the Tiva C, and are an important tool for interfacing with the external world.



UART stands for Universal Asynchronous Receiver/Transmitter, and it is a hardware communication protocol commonly found in microcontrollers, such as the Tiva C board. The UART allows for serial communication between two devices, using a single transmission line for both sending and receiving data. This is different from parallel communication, where multiple data lines are used to send and receive data simultaneously. The UART sends data one bit at a time, asynchronously, meaning that the data is not sent in a continuous stream but rather in discrete packets of bits. The sender and receiver must agree on the baud rate, which is the rate at which the data is transmitted, in order to correctly receive and interpret the data. UART communication is commonly used for connecting a microcontroller to other devices, such as sensors(GPS), displays, and other microcontrollers. It can also be used for communication between a microcontroller and a computer, allowing for serial data transfer over USB. Overall, the UART is a simple and versatile protocol forserial communication between devices, and is widely used in embedded systems and other electronic applications.



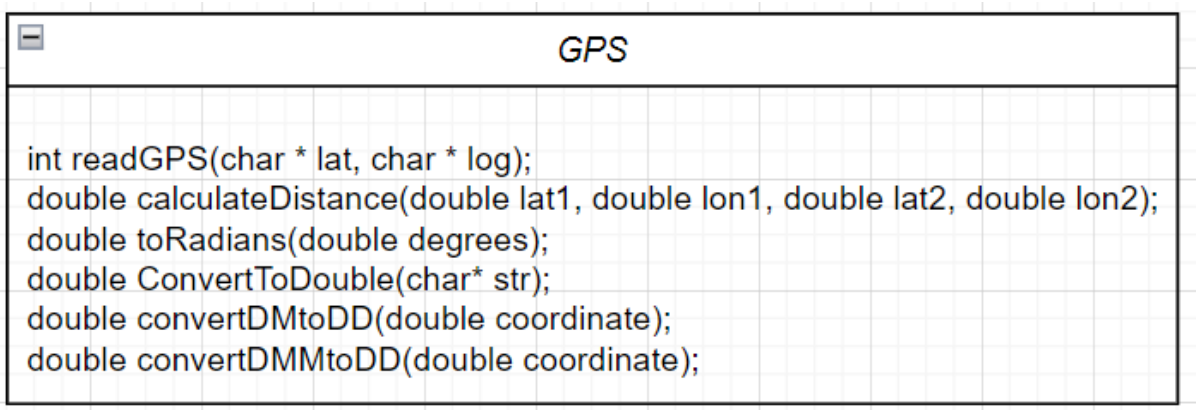
LEDs Module Interfaces with the GPIO Module functions to set or reset the value of the led pins in the registers.



The SYSTick timer can be used as a system timer to generate periodic interrupts at a fixed time interval. This can be useful for triggering periodic tasks such as reading GPS data, processing data, and sending data to a server.

The SYSTick timer is a 24-bit timer that can be configured to generate interrupts at specific intervals. It is typically used for system timing, such as generating periodic interrupts to keep track of time or trigger periodic tasks.

In a GPS tracking system, the SYSTick timer can be configured to generate interrupts at a fixed interval, such as every second or every few seconds. This interrupt can then trigger the microcontroller to read GPS data and process it for transmission to a server or storage in memory.Overall, the SYSTick timer can play an important role in the timing and coordination of tasks in a GPS tracking system project using Tiva C microcontroller.



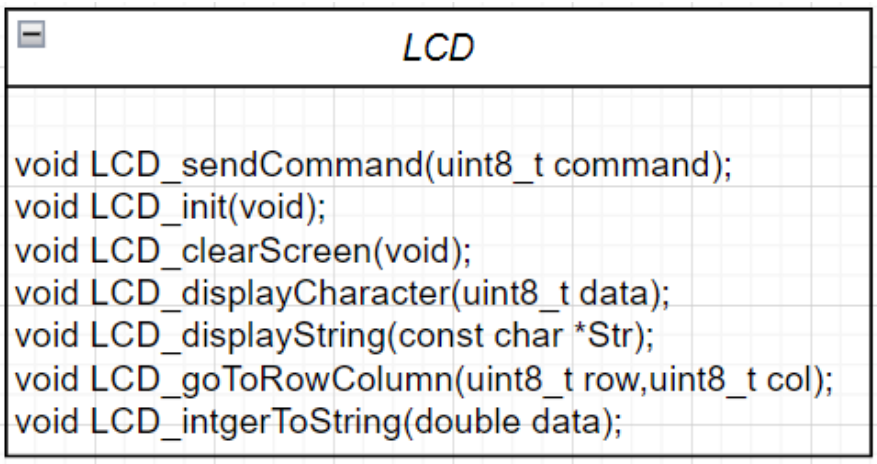
GPS sensor can be used to acquire accurate location data in the form of latitude and longitude coordinates. The GPS sensor communicates with the Tiva C microcontroller using a serial interface such as UART (Universal Asynchronous Receiver/Transmitter).

The GPS sensor receives signals from GPS satellites orbiting the Earth and calculates the user's location based on the time and position of the received signals. The GPS sensor then sends this data to the Tiva C microcontroller in the form of NMEA (National Marine Electronics Association) sentences.

The Tiva C microcontroller can receive and parse these NMEA sentences to extract the latitude and longitude coordinates. The microcontroller can then use this data to display the current location on an LCD screen, or to send the location data to a server for storage and analysis.

To interface with a GPS sensor, the Tiva C microcontroller can use one of its UART ports to communicate with the sensor. The microcontroller can send commands to the GPS sensor to configure its settings and request specific types of data.

Overall, using a GPS sensor with Tiva C microcontroller can provide accurate location data for a GPS tracking system project.



In our GPS tracking system project, we implemented a feature that displays the distance between two GPS coordinates on an LCD screen. We then programmed the microcontroller to display the distance on the LCD screen.This feature allows the user to quickly and easily see the distance between two points, which can be useful for navigation and tracking purposes.