# ENEL 400 Sub System Design – Motion Control

## System Function Definition:

Clarify subsystem objectives

* Develop the motion controls for operating the vehicle.
* The objective of this subsystem is to read the change in motion of the accelerometer and its configuration.
* These values will then will be read by the STM32 on the user controller and sent to the vehicles microcontroller.

Gestures

|  |  |  |
| --- | --- | --- |
| Forward/left | Forward | Forward/right |
| Left | Flat | right |
| Backwards/left | Backwards | Backwards/right |

Motion

|  |  |  |
| --- | --- | --- |
| Turn left | Forward | Turn right |
| Pivot Left | Stop | Pivot right |
| Turn left | Backwards | Turn right |

* Then these gestures will be measured by the STM32 and will be transmitted to the car.

Establish metrics for subsystem objectives

* We will be using an accelerometer which will be connected to the microcontroller using a serial interface. The microcontroller will convert the input into the orientation of the accelerometer.
* The orientation will be defined by angles of rotation about the accelerometers central axis.
* The STM32 will calculate these values and transmit them to the microcontroller on the vehicle.
* These values then will be received by the receiver on the car and the car will move accordingly.

Identify subsystem constraints

* The movement of hand will be restricted. It can move in certain directions and with certain speed.
* Reading and transmitting the data wirelessly.
* The car will not be fully gesture controlled due to limited amount of gestures.
* The car cannot travel beyond the range of the communication system.

Revise system function requirements.

* We will be using analog accelerometer(ADXL-362). It will be configured to read gestures from the user.

**Conceptual Subsystem Design**:

1. Establish Subsystems functions

* The car will move in the direction in which hand is moved.
* The subsystem will be able to detect 9 different gestures.

1. Establish Subsystems requirements (function specs)

* Required components are an accelerometer an STM and transmitter.

1. Establish means for subsystem functions

* An accelerometer will capture user gestures.
* A microcontroller will read the accelerometers measurements as an input an transmit the resulting gesture out to a second STM.
* We will use the radio link components for transmitting and receiving data.
* The second STM32 will be used to receive the data and move the car accordingly.

1. Generate subsystem function design alternatives.

* We might change what motion the car performs due to the users input.

1. Refine and apply subsystem metrics to subsystem function design alternatives.
   * Even if we change how the car reacts to the user input, we will keep the 9 input gestures the same.
2. Choose a subsystem design.

* We will use the ADL355 accelerometer
* We will use 2x STM 32 microcontroller
* Radio link (transmitter and receiver)