

# Etapa 2

ES070 - Laboratório de Sistemas  
embarcados



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Nísio José Soares Neto  
Pedro Henrique Limeira da Cruz

# Conteúdo

- Modificações no robô
- Sensor de Linha e Bateria
- Bluetooth
- Giroscópio e Acelerômetro
- Telemetria
- Cronograma e próximos passos

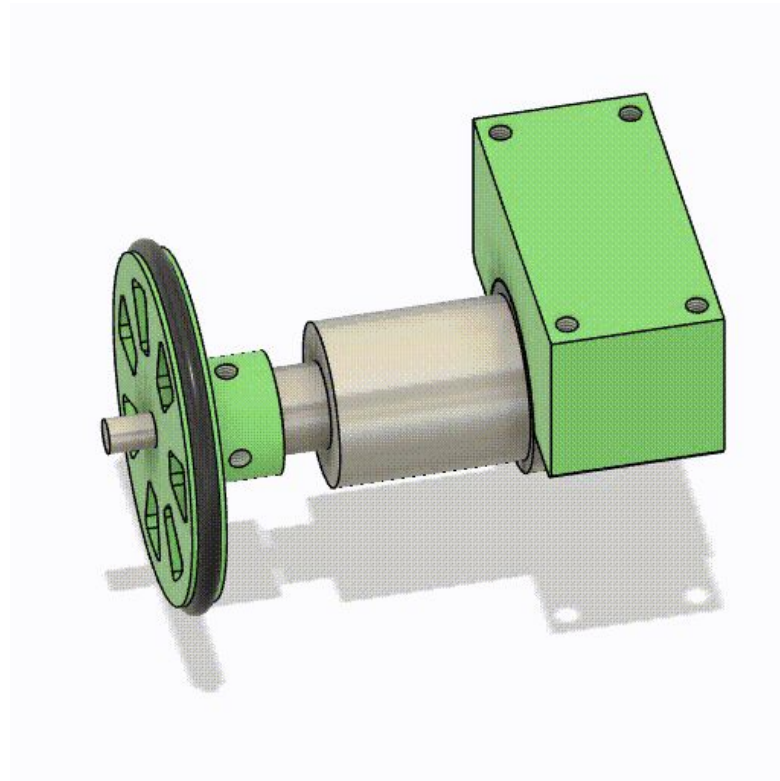
# Modificações do Projeto



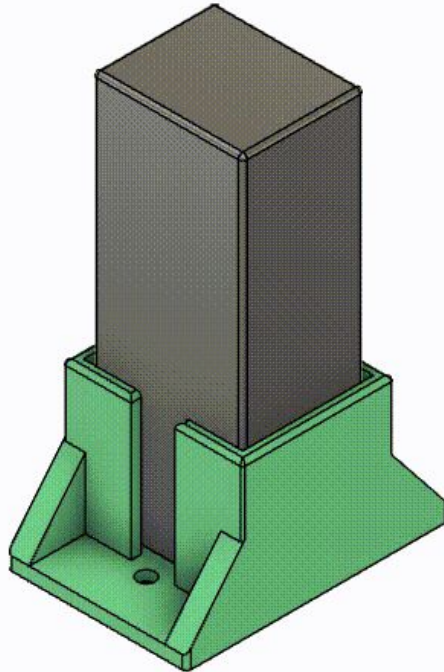
# Modificações

- Motores
  - Suporte
- Rodas
  - Modelo
- Bateria
  - Suporte
- Chassi
  - Furos
  - Passagem dos fios
- Placa Seguidor de Linha
  - Ajuste para encoders

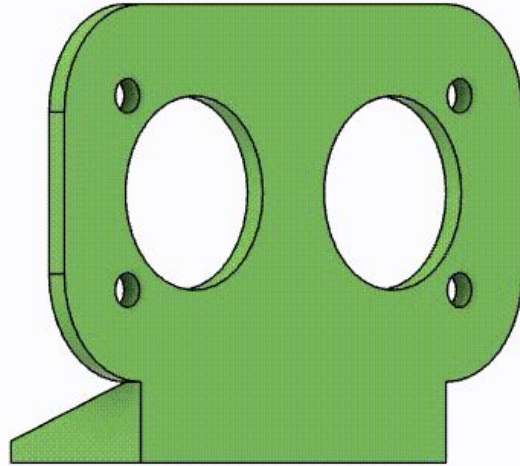
# Modificações



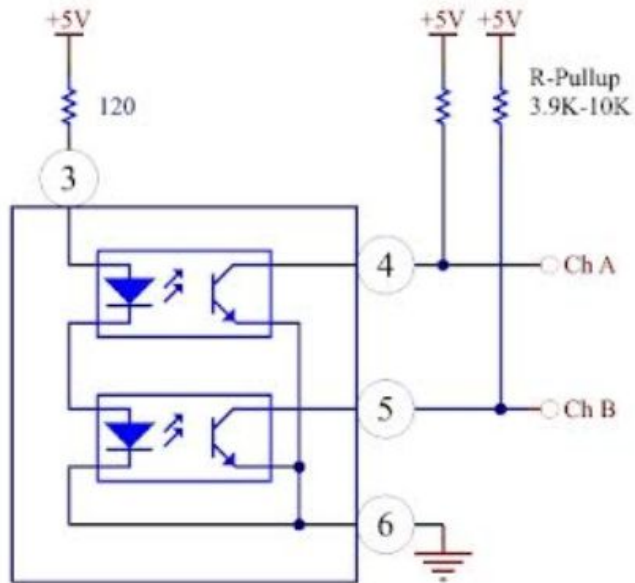
# Modificações



# Modificações

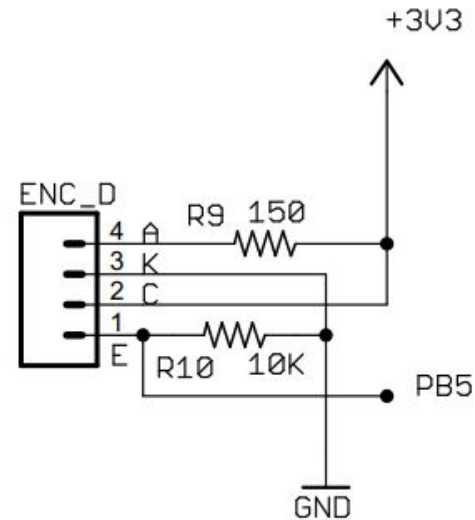


# Modificações



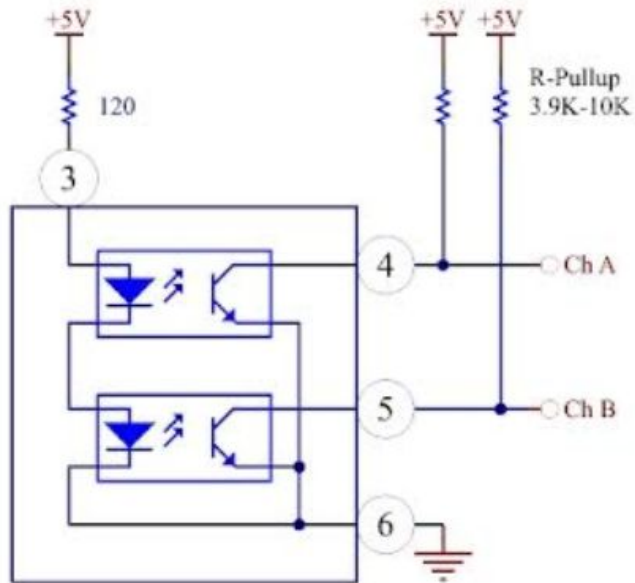
Sem luz -> **HIGH** (pull up)

Com luz -> **LOW**



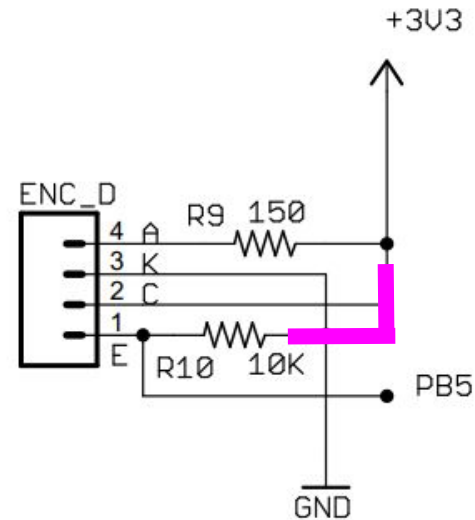


# Modificações

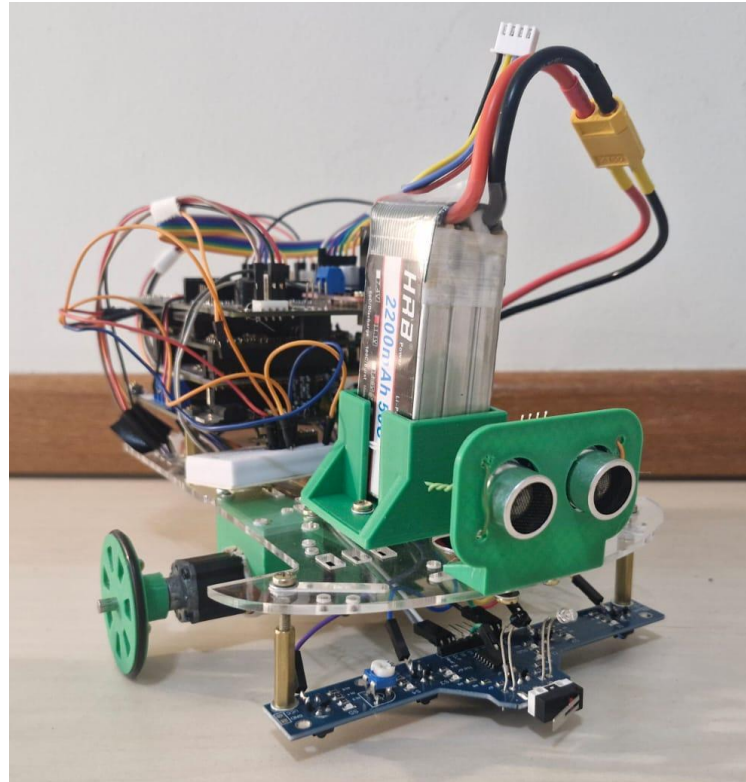


Sem luz -> **HIGH** (pull up)

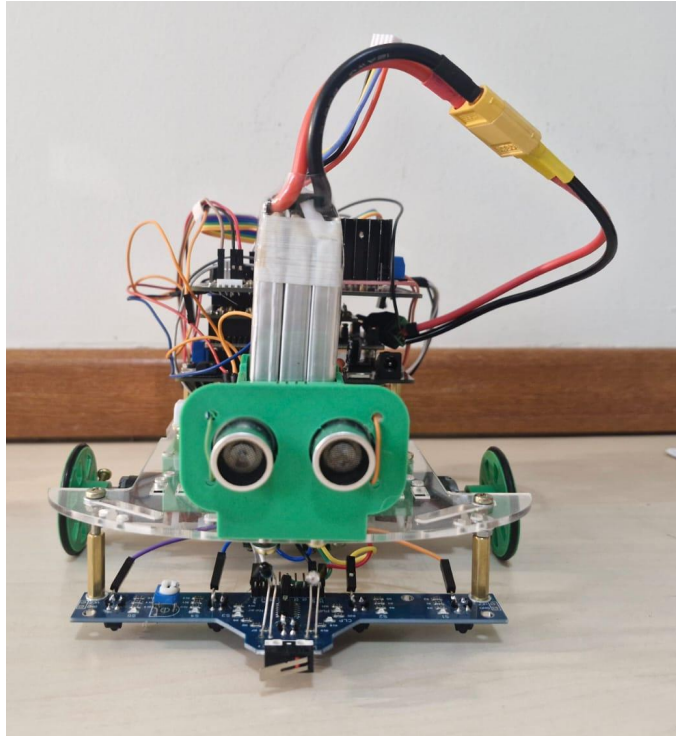
Com luz -> **LOW**



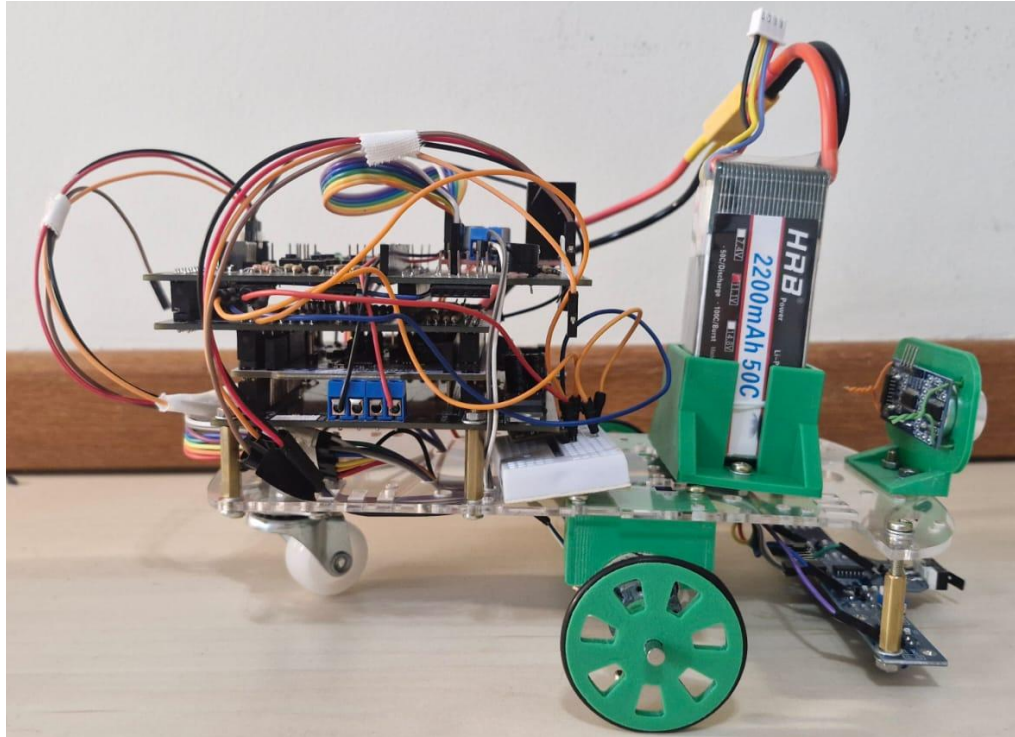
# Modificações



# Modificações



# Modificações



# Sensores ADC



# ADC

ADC2 Mode and Configuration

Mode

IN1 Disable

Configuration

Reset Configuration

NVIC Settings DMA Settings GPIO Settings

Parameter Settings User Constants

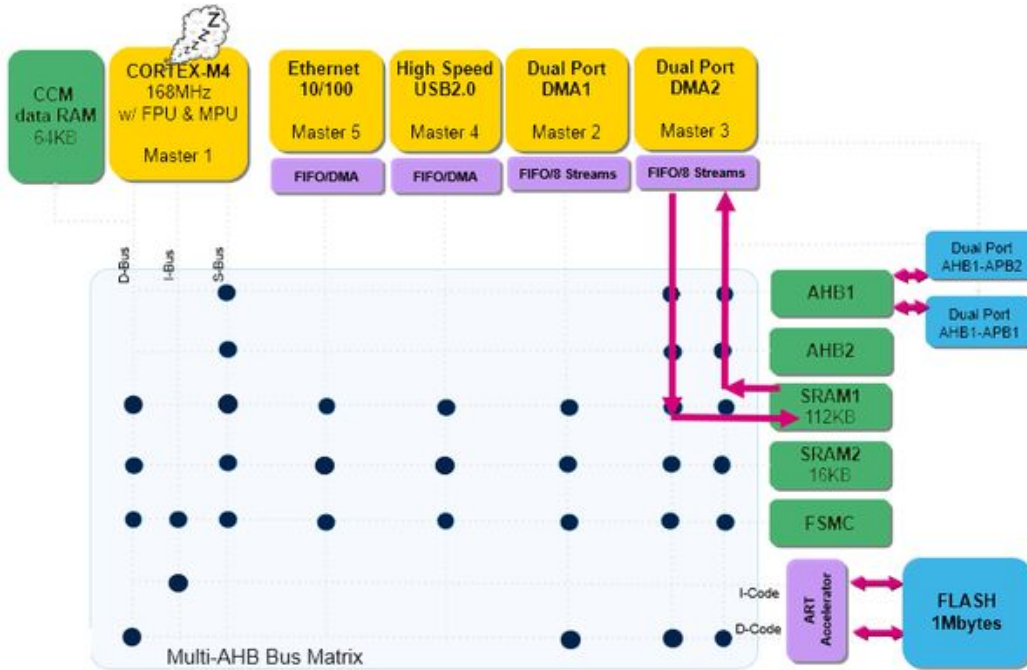
Configure the below parameters :

Search (Ctrl+F)

DMA Continuous Requests	Enabled
Overrun behaviour	Overrun data preserved
ADC_Regular_ConversionMode	
Enable Regular Conversions	Enable
Enable Regular Oversampling	Disable
Number Of Conversion	2
External Trigger Conversion Source	Regular Conversion launched by software
External Trigger Conversion Edge	None
Rank	1
Channel	Channel 3
Sampling Time	92.5 Cycles
Offset Number	No offset
Rank	2
Channel	Channel 4
Sampling Time	92.5 Cycles
Offset Number	No offset

- Escolha de sensores de linha Analógicos
- Configurações dos 6 sensores em 5 canais
- Obtenção de limites de medição

# DMA



```
void vBatterySystemComputeMeasurement(){

    *(pBattCharge) = xTelemetryData.uiRawAdcSensorData[1] >> 16;

}

void vLineSensorSystemProcessMeasurements(){
    (*pLineSensorData)[0] = (xTelemetryData.uiRawAdcSensorData[0]);
    (*pLineSensorData)[1] = (xTelemetryData.uiRawAdcSensorData[1] & 0x0000FFFF);
    (*pLineSensorData)[2] = (xTelemetryData.uiRawAdcSensorData[2]);
    (*pLineSensorData)[3] = xTelemetryData.uiRawAdcSensorData[3];
    (*pLineSensorData)[4] = xTelemetryData.uiRawAdcSensorData[4];

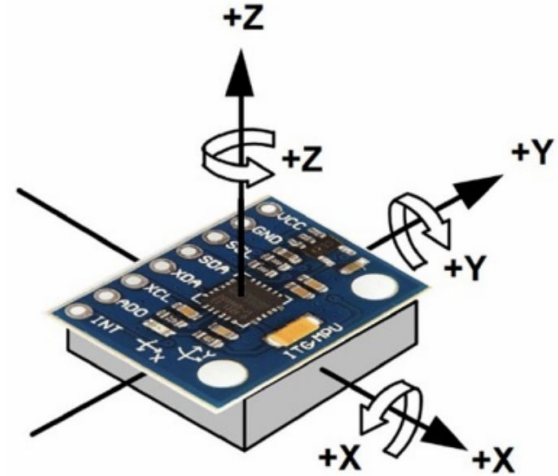
}
```

# Unidade de Medição Inercial (IMU)



# MPU6050

- Acelerômetro - Aceleração linear (g)
- Giroscópio - Velocidade angular ( $^{\circ}/s$ )
- Comunicação I2C
- Calibração - Erros estáticos
- Filtro digital passa baixo

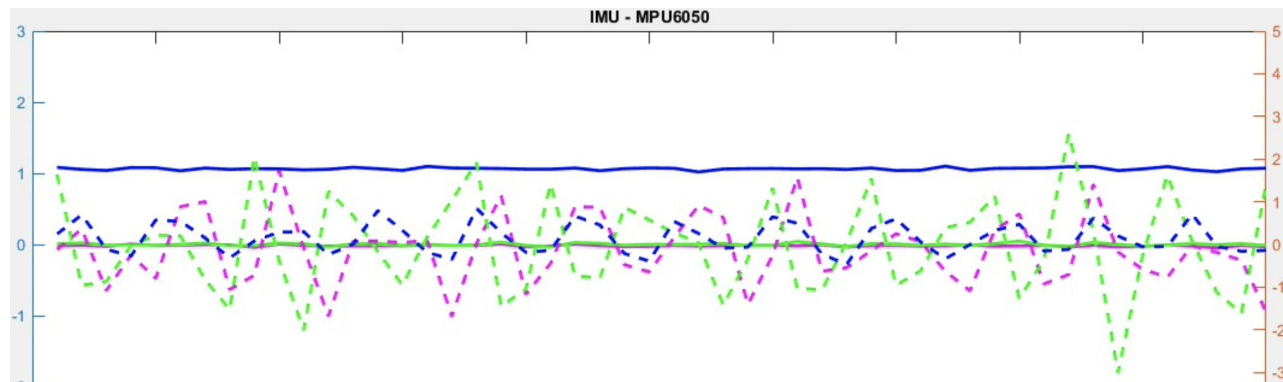


# MPU6050 – Filtro digital passa baixo

DFLP\_CFG = 0

Largura Banda 256Hz

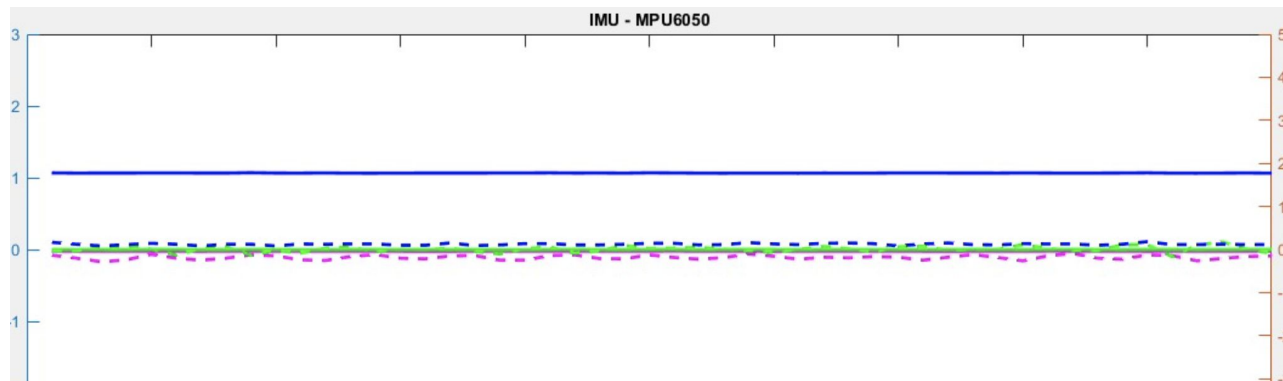
Delay 0.98ms



DFLP\_CFG = 6

Largura Banda 5Hz

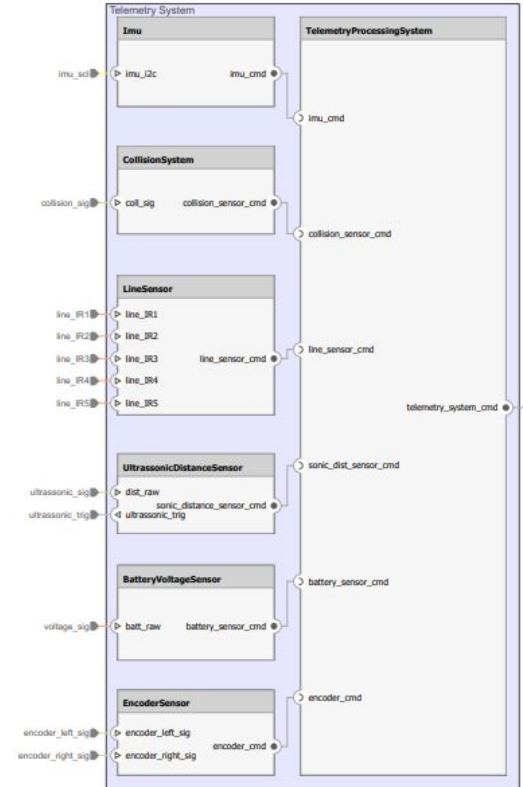
Delay 18.6ms

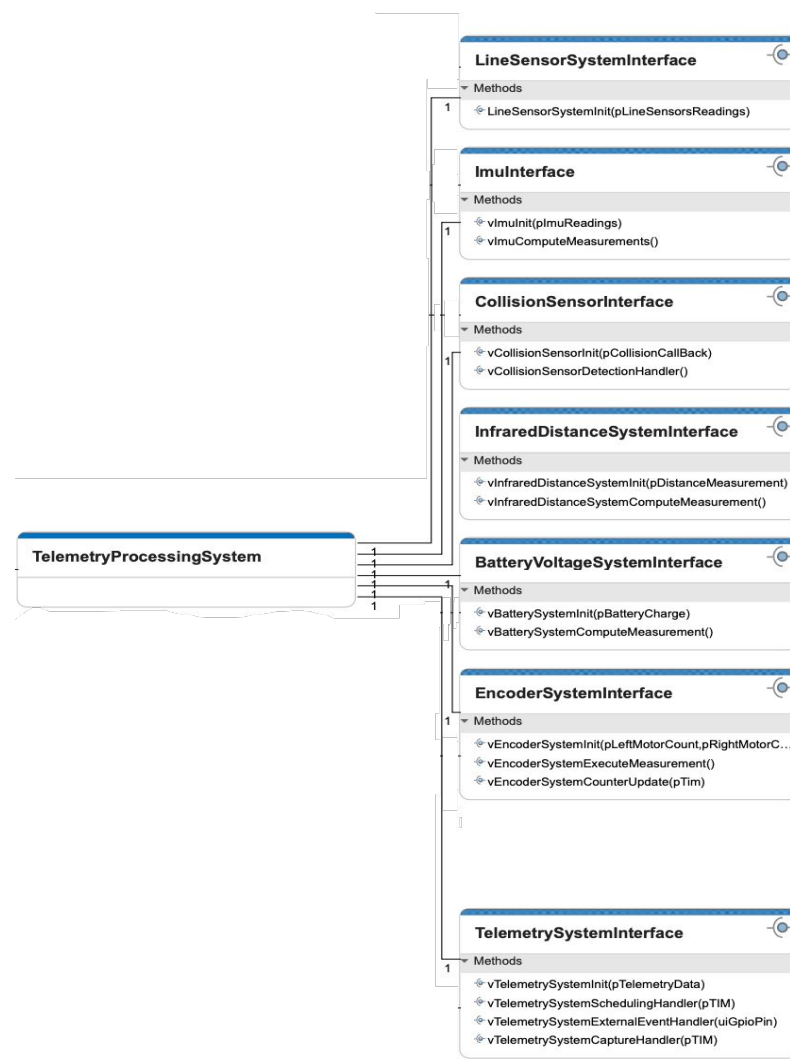


# Telemetry Processing System

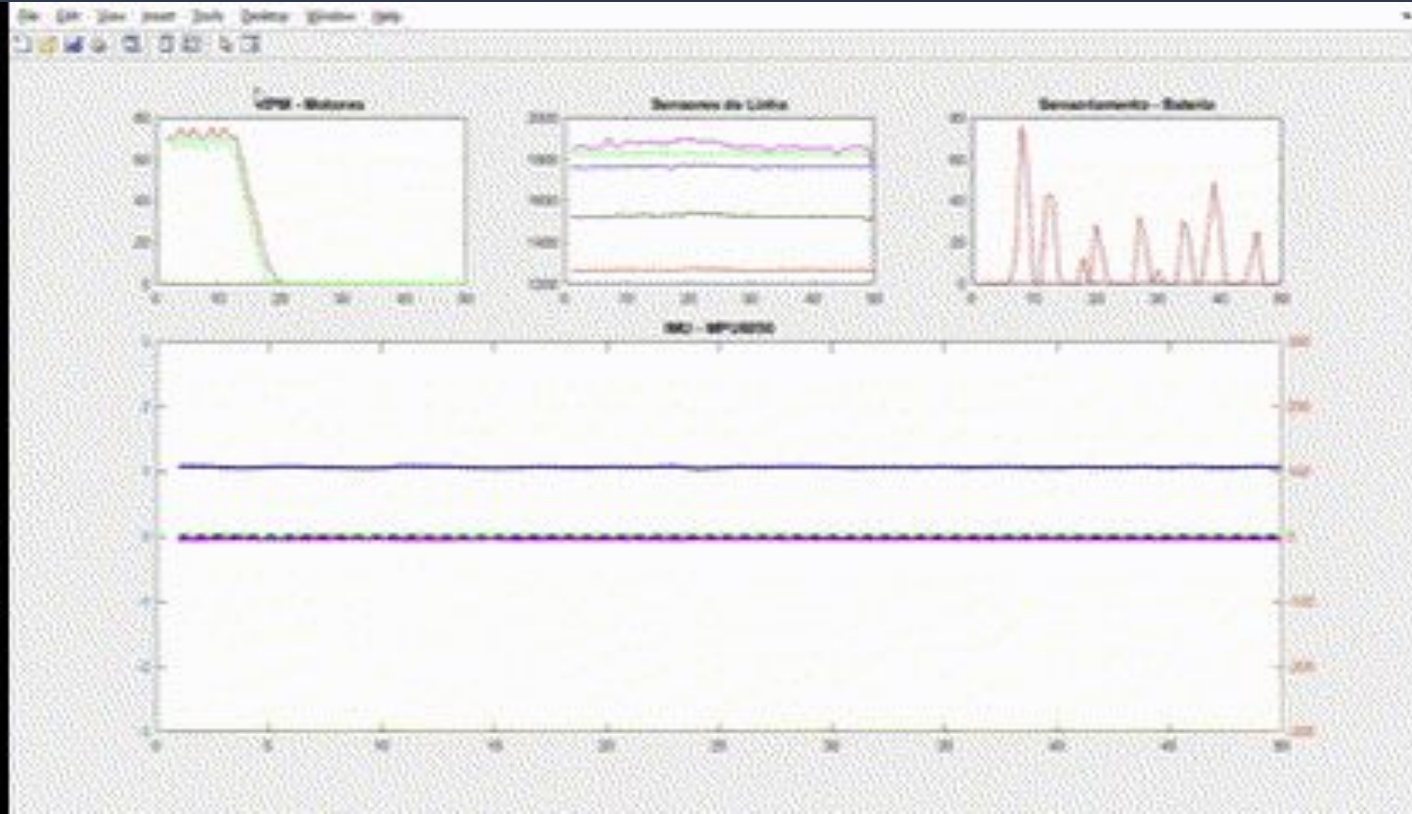
# Telemetry Processing System

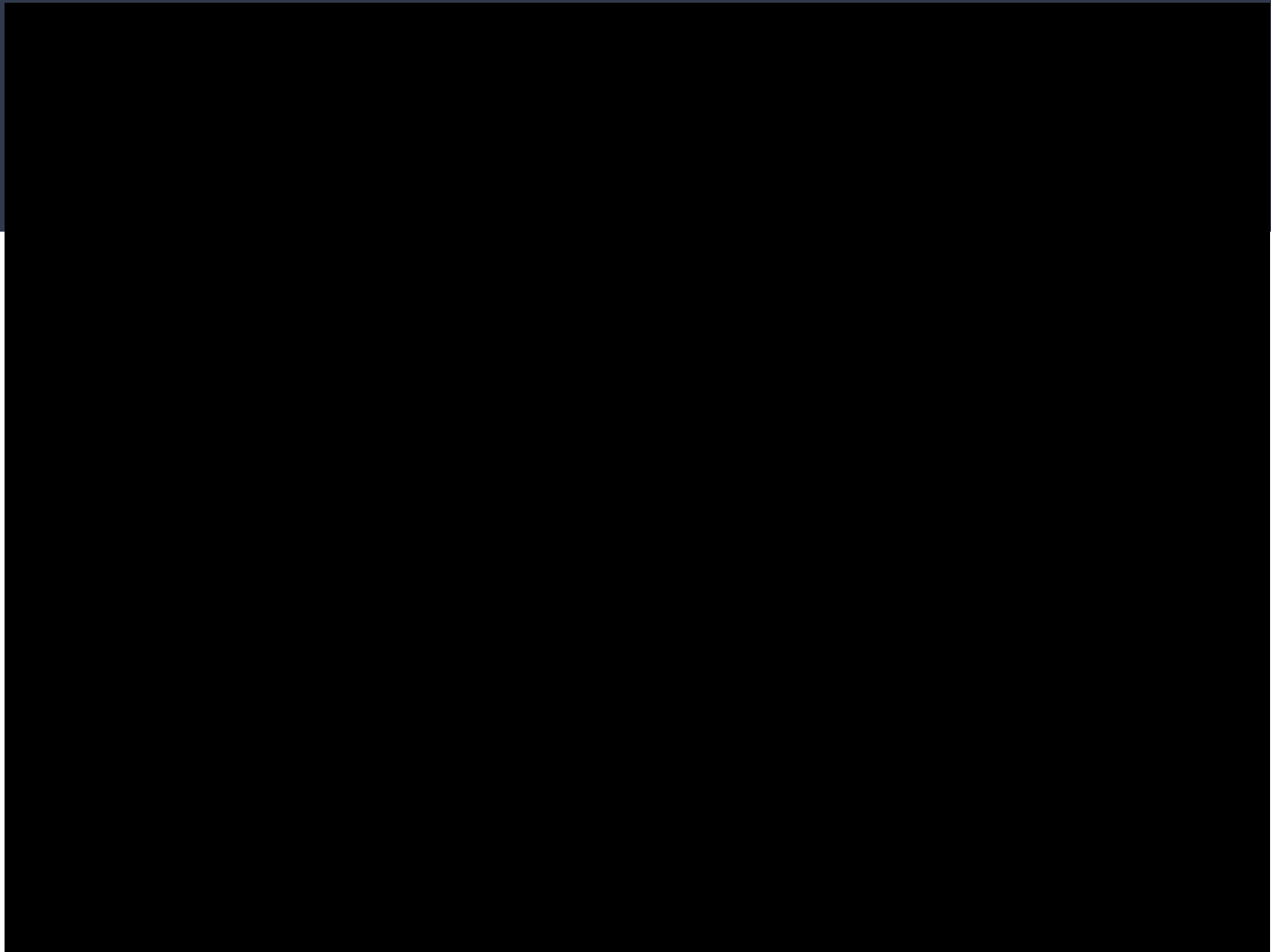
- Sistema Orquestrador:
  - Tempo de Amostragem
  - Gerenciamento de Interrupções
  - Interface entre a aplicação principal e os drivers de cada sensor.





# Telemetry Processing System





# Bluetooth

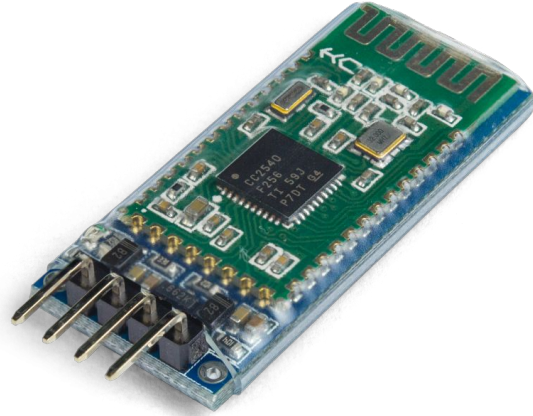




# Módulo Bluetooth



**HC05**

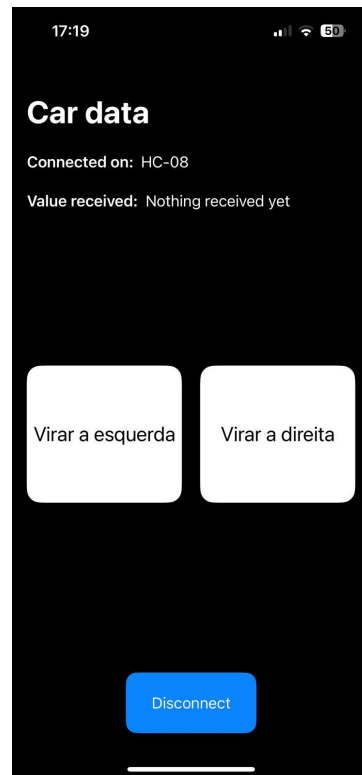
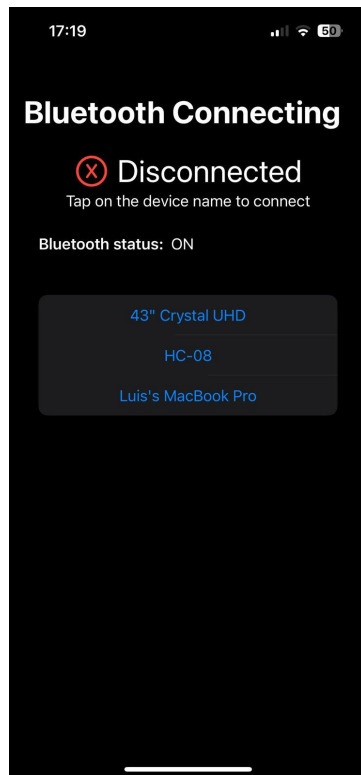


**HC08**

# Interface inicial



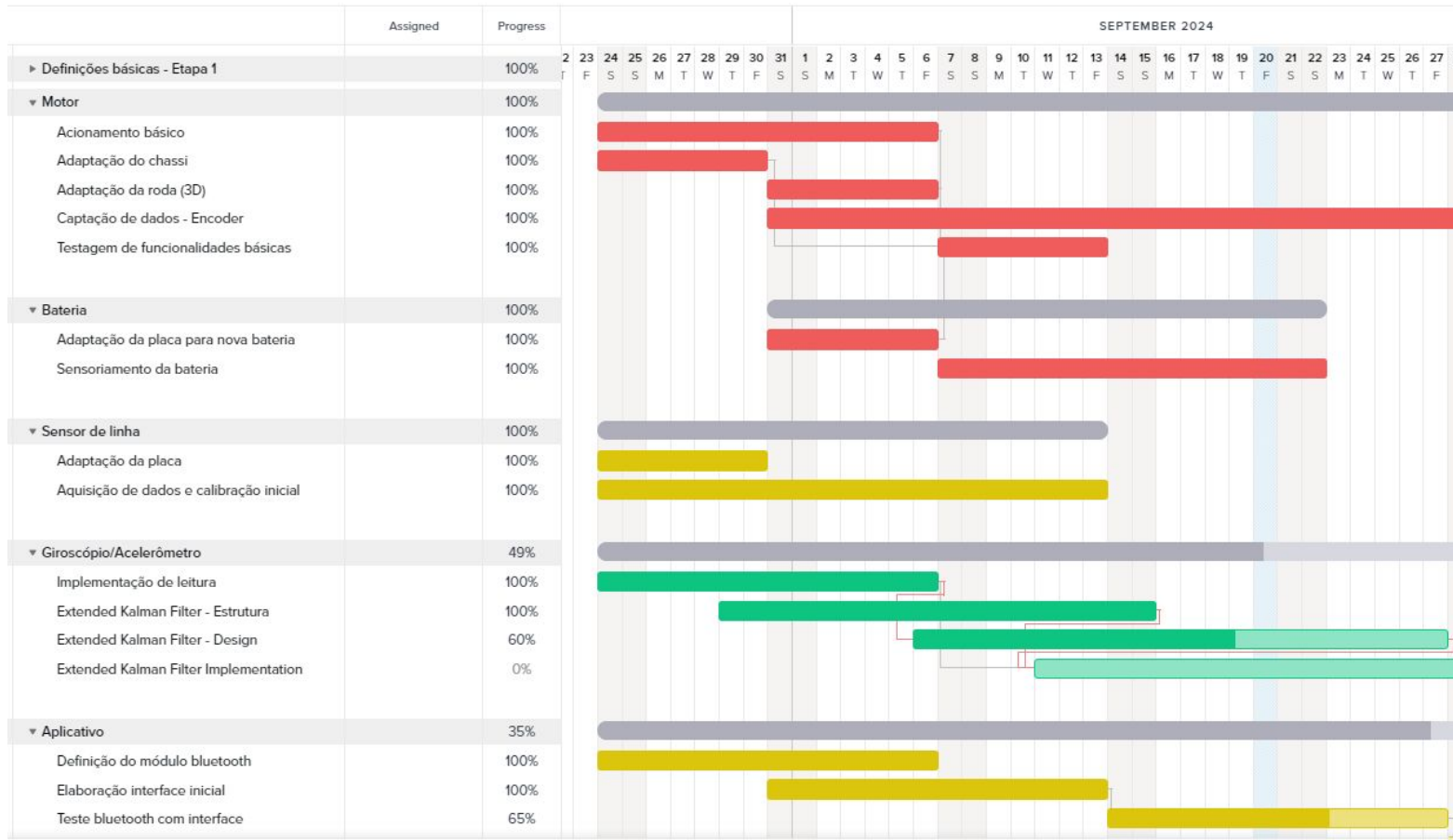
# Interface inicial



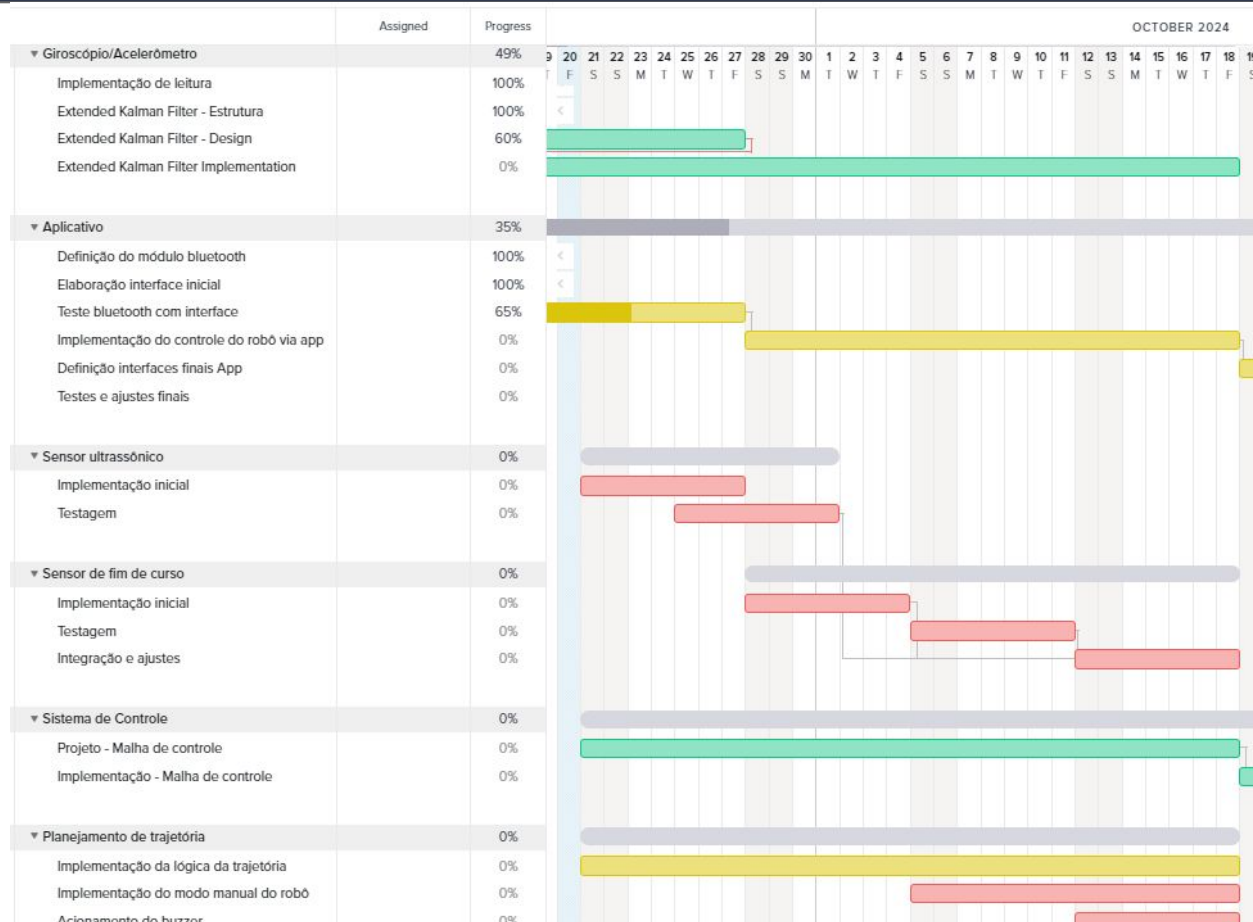
# Cronograma



## Etapa 02 - Realizado



# Etapa 03 – Planejado



# Participação



# Porcentagem

## Etapa 1

Mariana	16,67%
Natália	16,67%
Pedro	16,67%
Isabelle	16,67%
Nísio	16,67%
Luis	16,67%

## Etapa 2

Mariana	20%
Natália	20%
Pedro	15%
Isabelle	15%
Nísio	15%
Luis	15%