Bluetooth Controlled R/C Car with Line Follower

MARCH 15

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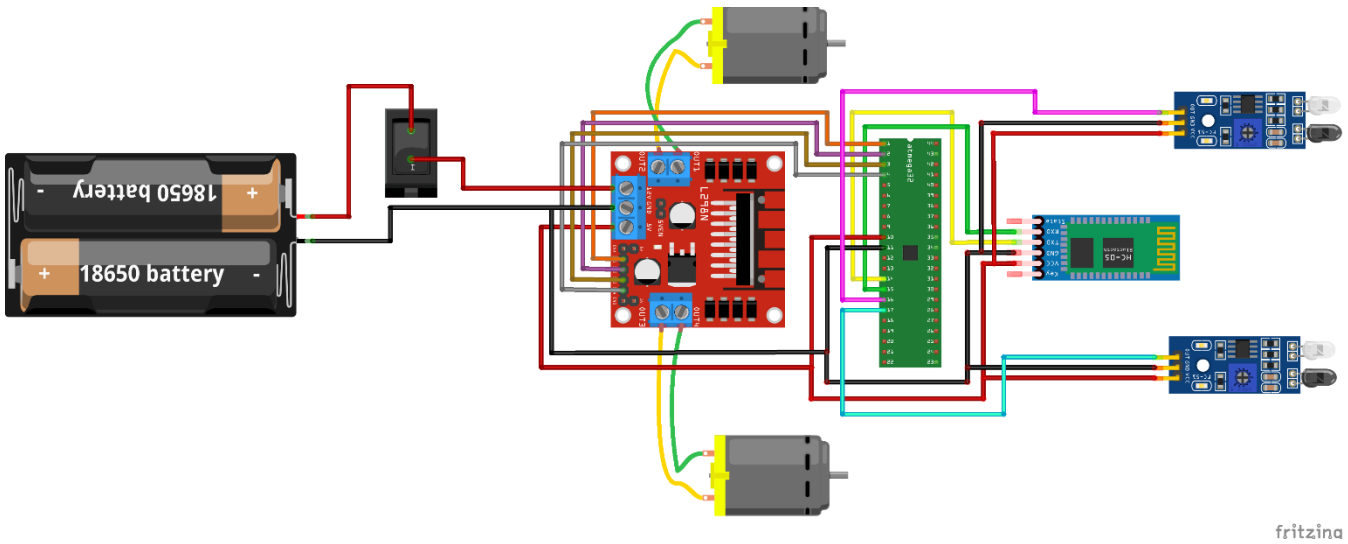
1. Static Design

1.1 Components

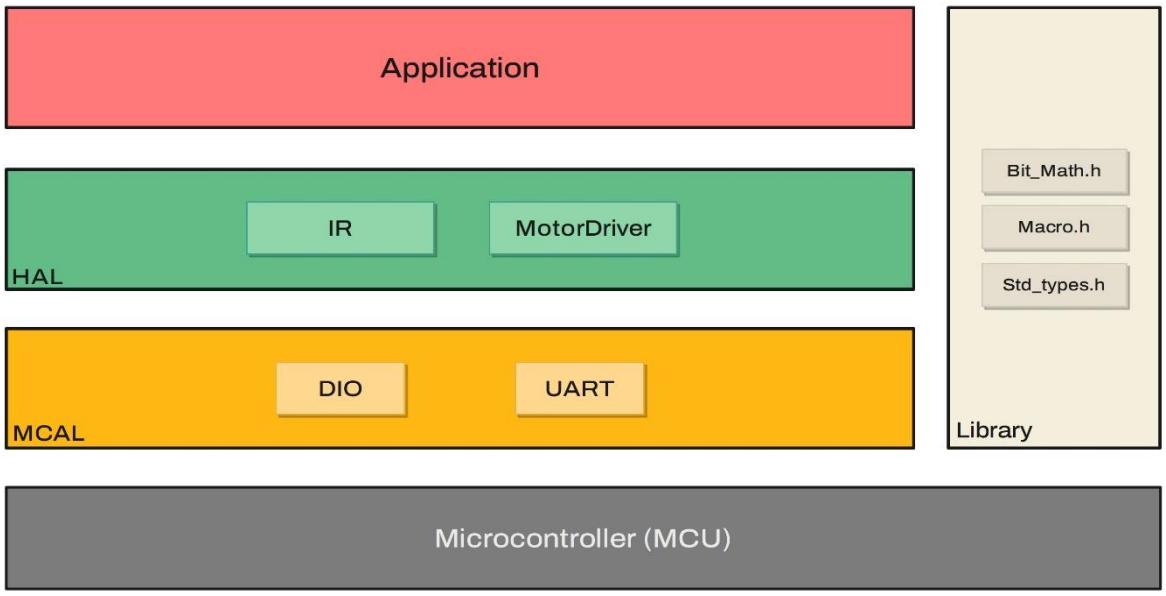
1. 1x AVR Development Board (Atmega32)
2. 1x Motor Driver L298N
3. 2x IR Sensors
4. 1x HC-05 Bluetooth Module
5. 2x DC Motors
6. 1x Car Chassis
7. 2x Li-ion 18650 Battery
8. 1x 2 slots Battery holder
9. 1x 2pin On/Off G130 Boat Rocker Switch

1.2 Schematic



1.3 Layered Architecture

Making the layered architecture and specifying components and modules.



1.2 APIs and Typedefs

1.2. DIO

1.2.1.1 APIs

Name	DIO_u8SetPinDir
Syntax	RequestState DIO_u8SetPinDir(u8 Local_GroupName, u8 Local_PinNumber, u8 Local_PinState);
Description	Set the direction of the PIN
Sync/Async	Synchronous
Reentrancy	Non-Reentrant
Parameters(in)	Local_GroupName, Local_PinNumber, Local_PinState
Parameters(out)	None
Return value	RequestState

Name	DIO_u8SetPinValue
Syntax	RequestState DIO_u8SetPinValue(u8 Local_GroupName, u8 Local_PinNumber, u8 Local_PinValue);
Description	Sets the the PIN
Sync/Async	Synchronous
Reentrancy	Non-Reentrant

Parameters(in)	Local_GroupName, Local_PinNumber, Local_PinValue
Parameters(out)	None
Return value	RequestState

Name	DIO_u8GetPinValue
Syntax	RequestState DIO_u8GetPinValue(u8 Local_GroupName, u8 Local_PinNumber, u8 *Local_PinValue);
Description	Reads the value of the PIN
Sync/Async	Synchronous
Reentrancy	Non-Reentrant
Parameters(in)	Local_GroupName, Local_PinNumber, Local_PinValue
Parameters(out)	None
Return value	RequestState

Name	DIO_u8SetPortDir
Syntax	RequestState DIO_u8SetPortDir(u8 Local_GroupName, u8 Local_PortState);
Description	Sets the direction of the PORT
Sync/Async	Synchronous
Reentrancy	Non-Reentrant
Parameters(in)	Local_GroupName, Local_PortState
Parameters(out)	None
Return value	RequestState

Name	DIO_u8SetPortValue
Syntax	RequestState DIO_u8SetPortValue(u8 Local_GroupName, u8 Local_PortValue);
Description	Sets the PORT with a specific value
Sync/Async	Synchronous
Reentrancy	Non-Reentrant
Parameters(in)	Local_GroupName,Local_PortValue
Parameters(out)	None
Return value	RequestState

Name	DIO_u8GetPortValue
Syntax	RequestState DIO_u8GetPortValue(u8 Local_GroupName, u8 *Local_PortValue);
Description	Reads the value of the PORT
Sync/Async	Synchronous

Reentrancy	Non-Reentrant
Parameters(in)	Local_GroupName, Local_PortValue
Parameters(out)	None
Return value	RequestState

Name	DIO_u8ControlPullup
Syntax	RequestState DIO_u8ControlPullup(u8 Local_ConnectionType, u8 Local_GroupName, u8 Local_PinNumber, u8 Local_PullupState);
Description	Enable or Disable PullUp resistor of the PIN
Sync/Async	Synchronous
Reentrancy	Non-Reentrant
Parameters(in)	Local_ConnectionType, Local_GroupName, Local_PinNumber, Local_PullupState
Parameters(out)	None
Return value	RequestState

1.2.1.2 Typedefs

Name	RequestState
Type	enum
Description	An enum for handling Errors: RequestHandled, RequestErrorGroupOutOfRange, RequestErrorPinOutOfRange, RequestErrorNotValidState, and RequestErrorNotValidValue

1.2.2 UART

1.2.2.1 APIs

Name	UART_VoidInit
Syntax	void UART_VoidInit(u16 Baudrate);
Description	Initializes UART module with the desired configurations
Sync/Async	Synchronous
Reentrancy	Non-Reentrant
Parameters(in)	Baudrate
Parameters(out)	None
Return value	void

Name	UART_TxChar
Syntax	void UART_TxChar(u8 local_data);
Description	Sends a char to the receiver
Sync/Async	Synchronous

Reentrancy	Non-Reentrant
Parameters(in)	local_data
Parameters(out)	None
Return value	void

Name	UART_TxString
Syntax	void UART_TxString(u8 *string);
Description	Sends a string to the receiver
Sync/Async	Synchronous
Reentrancy	Non-Reentrant
Parameters(in)	string
Parameters(out)	None
Return value	void

Name	UART_RxChar
Syntax	u8 UART_RxChar(void);
Description	Receives a char from the transmitter
Sync/Async	Synchronous
Reentrancy	Non-Reentrant
Parameters(in)	void
Parameters(out)	None
Return value	u8

Name	UART_RxString
Syntax	void UART_RxString(char* string);
Description	Receives a string from the transmitter
Sync/Async	Synchronous
Reentrancy	Non-Reentrant
Parameters(in)	string
Parameters(out)	None
Return value	void

1.2.3 MotorDriver

1.2.3.1 APIs

Name	MDriver_init
Syntax	void MDriver_init(void);
Description	Initializes Motor Driver module
Sync/Async	Synchronous
Reentrancy	Non-Reentrant

Parameters(in)	void
Parameters(out)	None
Return value	void

Name	MDriver_MoveBackward
Syntax	void MDriver_MoveBackward(void);
Description	Moves the car backward
Sync/Async	Synchronous
Reentrancy	Non-Reentrant
Parameters(in)	void
Parameters(out)	None
Return value	void

Name	MDriver_MoveRight
Syntax	void MDriver_MoveRight(void);
Description	Moves the car to the right
Sync/Async	Synchronous
Reentrancy	Non-Reentrant
Parameters(in)	void
Parameters(out)	None
Return value	void

Name	MDriver_MoveLeft
Syntax	void MDriver_MoveLeft(void);
Description	Moves the car to the left
Sync/Async	Synchronous
Reentrancy	Non-Reentrant
Parameters(in)	void
Parameters(out)	None
Return value	void

Name	MDriver_MoveForRight
Syntax	void MDriver_MoveForRight(void);
Description	Moves the car forward right
Sync/Async	Synchronous
Reentrancy	Non-Reentrant
Parameters(in)	void
Parameters(out)	None
Return value	void

Name	MDriver_MoveForLeft
Syntax	void MDriver_MoveForLeft(void);
Description	Moves the car forward left
Sync/Async	Synchronous
Reentrancy	Non-Reentrant
Parameters(in)	void
Parameters(out)	None
Return value	void

Name	MDriver_MoveBackRight
Syntax	void MDriver_MoveBackRight(void);
Description	Moves the car backward right
Sync/Async	Synchronous
Reentrancy	Non-Reentrant
Parameters(in)	void
Parameters(out)	None
Return value	void

Name	MDriver_MoveBackLeft
Syntax	void MDriver_MoveBackLeft(void);
Description	Moves the car backward left
Sync/Async	Synchronous
Reentrancy	Non-Reentrant
Parameters(in)	void
Parameters(out)	None
Return value	void

Name	MDriver_Stop
Syntax	void MDriver_Stop(void);
Description	Stops the car
Sync/Async	Synchronous
Reentrancy	Non-Reentrant
Parameters(in)	void
Parameters(out)	None
Return value	void

1.2.4 IR

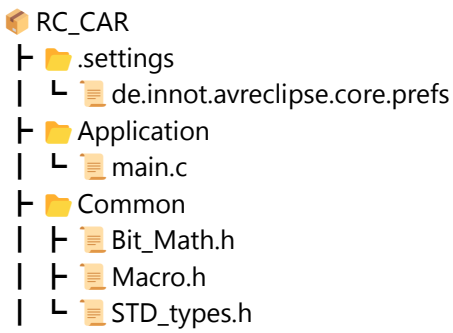
1.2.4.1 APIs

Name	IRSensors_init
Syntax	void IRSensors_init(void);
Description	Initializes IR Sensors
Sync/Async	Synchronous
Reentrancy	Non-Reentrant
Parameters(in)	void
Parameters(out)	None
Return value	void

Name	Read_IRSensor_Right
Syntax	u8 Read_IRSensor_Right(void);
Description	Reads the value of the Right IR Sensor
Sync/Async	Synchronous
Reentrancy	Non-Reentrant
Parameters(in)	void
Parameters(out)	None
Return value	u8

Name	Read_IRSensor_Left
Syntax	u8 Read_IRSensor_Left(void);
Description	Reads the value of the Left IR Sensor
Sync/Async	Synchronous
Reentrancy	Non-Reentrant
Parameters(in)	void
Parameters(out)	None
Return value	u8

1.3 Folder Structure



```
├ Debug
|  ├ Application
|  |  ├ main.d
|  |  ├ main.o
|  |  └ subdir.mk
|  ├ HAL
|  |  ├ IR
|  |  |  └ Source
|  |  |  |  ├ IR_Program.d
|  |  |  |  ├ IR_Program.o
|  |  |  |  └ subdir.mk
|  |  └ MotorDriver
|  |  |  └ Source
|  |  |  |  ├ MotorDriver_Program.d
|  |  |  |  ├ MotorDriver_Program.o
|  |  |  |  └ subdir.mk
|  ├ MCAL
|  |  ├ DIO
|  |  |  └ Source
|  |  |  |  ├ DIO_Imp.d
|  |  |  |  ├ DIO_Imp.o
|  |  |  |  └ subdir.mk
|  |  └ UART
|  |  |  └ Source
|  |  |  |  ├ subdir.mk
|  |  |  |  ├ UART_program.d
|  |  |  |  └ UART_program.o
|  ├ DriversRepo.lss
|  ├ DriversRepo.map
|  ├ makefile
|  ├ objects.mk
|  ├ RC_CAR.elf
|  ├ RC_CAR.hex
|  ├ RC_CAR.lss
|  ├ RC_CAR.map
|  └ sources.mk
├ HAL
|  ├ IR
|  |  ├ Header
|  |  |  ├ IR_Config.h
|  |  |  └ IR_Interface.h
|  |  └ Source
|  |  |  └ IR_Program.c
|  └ MotorDriver
|  |  ├ Header
|  |  |  ├ MotorDriver_Config.h
|  |  |  └ MotorDriver_Interface.h
|  |  └ Source
|  |  |  └ MotorDriver_Program.c
├ MCAL
|  ├ DIO
|  |  ├ Header
```

```
|  |  |  ├ DIO_Config.h
|  |  |  ├ DIO_Interface.h
|  |  |  ├ DIO_Private.h
|  |  |  └ DIO_Registers.h
|  |  └ Source
|  |  |  └ DIO_Imp.c
|  └ UART
|  |  ├ Header
|  |  |  ├ UART_Config.h
|  |  |  ├ UART_Interface.h
|  |  |  ├ UART_Private.h
|  |  |  └ UART_Register.h
|  |  └ Source
|  |  |  └ UART_program.c
├ .cproject
└ .project
```