Lab 2 - Real Time Systems
Group 5

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Part 1

Question: Do you see any variation in light sensor values depending on the color of the surface? Give an idea of how to distinguish between two different surfaces (light and dark) using this light sensor.

Answer: Yes,there is variation in light sensor values depending on the color of the surface. During the direction of light sensor towards a white surface ,highest value given by the light sensor is 59. Again when the light sensor is directed towards a black surface it gives a value of 25.Thus reflected properties(dark or light) of surface can be measured from this. So its like where the value is more,the surface will be lighter one as more light is reflected there.

Part 2

Question: Is it possible to implement part 2 using only one task? Explain advantages or disadvantages if using one task for this assignment according to your understanding.

Answer: Yes,this is possible. If only one task is used for this assignment the advantages is we don't need to use any priorities and also any protected objects. But if only one task is used then there will be some disadvantage for example the tasks may not be run for various periods also the code may be little bit difficult to deal.

Part 3

Question: How did you implement the driving command and its execution?

Answer: In the code that was followed by us, Driving Command is a Protected Object containing two procedures and one function which point to a record driving_command_type:

- function Get returns the updated driving command type
- procedure Set_Speed is used to update the record within the protected object only when the priority of the new record is greater than the previous one
- procedure Set_Override is used to update the record within the protected irrespective of prioritization.

On pressing the button task, the Set_Speed procedure will uplift the priority and add new values for duration, speed and direction causing the motor to move in the reverse direction for a certain period of time. When the duration ends, the motor control task will overwrite the driving command to the least priority ensuring that the task measuring the distance controls the driving.

Part 4

Question: Explain the way (like algorithm, PID, etc) you have implemented the line tracking functionality in this exercise.

Answer: A P-controller is used to solved this exercise. Here light sensor take the different values from track and this p-controller uses the values to determine a turn-proportion based on the difference between the predefined offset(Gray) value and the acquired light value.
From the track the robot start to read the offset(Gray) value and its adjust itself to the turn ratio and also to the direction of this turn. An error value will be created as the newly read light value by light sensor will be subtracted from predefined offset value. Here two condition is taken . First condition is when the error is greater than zero. In this case a k factor is taken to scaled the error. It can be said that for every 1 unit error change ,the power of one motor will be increased by 10 and a multiplier is also used to get the optimal turn ratio. For making the right wheel to take a right turn this calculated turn ratio is subtracted from turn multiplier (1.0). Second condition is if the error is less than zero .In this case to make a left turn ,Left wheel multiplier has done the same thing.

References:

- **http://www.inpharmix.com/jps/PID_Controller_For_Lego_Mindstorms_Robots.html**
- **https://learn.adacore.com/**
- **Followed all the example codes given in demos,drivers,facilities and basic test given in lab web page**