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Team 19: Robot Control Specification Document

Laboratory # 2: Requirements and Specification

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Work Product

The Specification Document describes the behavior of the robot control system. It includes the glossary, mode definition, mode transition table, conditions, input and output data items, and event table.

Document Revision Information

Document Revision Information

2/10/2013 – Template created
2/15/2013 – Mode definitions and events
2/18/2013 – Input and output data items
2/22/2013 – Glossary and event table
2/24/2013 - Completed

Approval Sheet

All group members whose names are listed below approve of the document and contributed fairly.

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Pledge

On my honor, as a student, I have neither given nor received unauthorized aid on this assignment.

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Glossary

Symbolic Constants

Name	Definition	Value
max_speed	max speed of motors	TO BE DETERMINED
$NoOp$	no operation is taken by GUI	Null
$pressed$	button on GUI is pressed down	True
$released$	butoon on GUI was pressed and has been released	True
arc_radius	radius of arc taken by robot when multiple buttons pressed	TO BE DETERMINED

Text Macros

Name	Definition
!connection!	connection between the robot and base station
!error_message_table!	listing of all error messages to error code
!reading!	decoded /input_message/ to be displayed
!response!	message sent from robot to base station

Input Data Items

Name	Definition
/button_backwad/	controls backward movement
/button_forward/	controls forward movment
/button_left/	controls movement left
/button_right/	controls movement right
/button_sensor_light/	displays light sensor information

/button_sensor_unltrasonic/	displays ultrasonic sensor information
/input_speed/	input for new speed
/button_get_connection/	get connection
/button_end_connection/	end connection
/button_change_speed/	changes speed of robot
/input_message/	message received from robot

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110 ## Output Data Items
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Name	Definition
//data_log//	display for messages from robot
//sensor_light//	display for light sensor
//sensor_touch//	display for touch sensor
//sensor_sound//	display for sound sensor
//sensor_ultrasonic//	display for ultrasonic sensor
//output message//	message sent to robot

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113 ## Conditions
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Name	Definition
%connection_received%	Whether a connection is created or not.
%get_connection%	/button_get_connection/ = $released$
%message_recieved%	A message
%time_out%	10 seconds no response
%connected%	!connection! = True
%end_connection%	/button_end_connection/ = $released$
%is_error_message%	Whether /input_message/ is error

Set of Modes

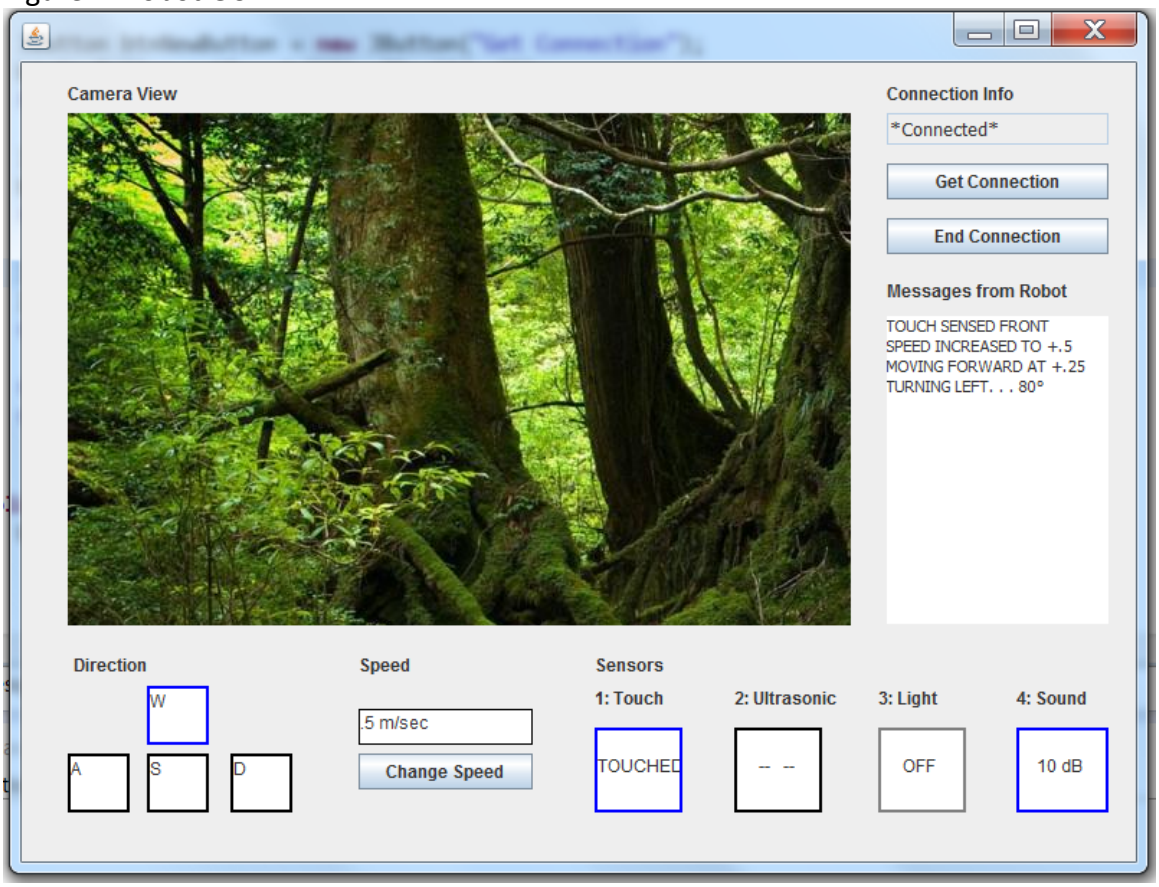
Name	Definition
Normal Operation	%connected%
Awaiting Connection	!connection! = false /button_get_connection/ = $pressed$
No Connection	!connection! = false

Mode Transition Table

	Normal Operation	*Awaiting Connection*	*No Connection*
Normal Operation		@T(%connection_received%)	@T(%end_connection%)
Awaiting Connection	@T(%connection_received)		@T(%time_out%)
No Connection		@T(%get_connection%)	

Define User Interface

Figure 1. Robot GUI



Inputs and Outputs

Inputs

Input data item: Forward push button
Acronym: /button_forward/
Hardware: Switch, normally open
Description: /button_forward/
- controls forward movement
- while pressed move forward, when released stop

Input data item: Backward push button
Acronym: /button_backward/
Hardware: Switch, normally open
Description: /button_backward/
- controls backwards movement
- while pressed move backward, when released stop

Input data item: Right push button
Acronym: /button_right/
Hardware: Switch, normally open
Description: /button_right/
- controls movement right

Input data item: Left push button
Acronym: /button_left/
Hardware: Switch, normally open
Description: /button_left/
- controls movement left

Input data item: Light sensor button
Acronym: /button_sensor_light/
Hardware: Switch, normally open
Description: /button_sensor_light/
-data from light sensor will be displayed in light sensor display

Input data item: Ultrasonic sensor button
Acronym: /button_sensor_ultrasonic/
Hardware: Switch, normally open
Description: /button_sensor_ultrasonic/
-data from ultrasonic sensor will be displayed in ultrasonic sensor display

Input data item: Speed input
Acronym: /input_speed/
Hardware: Switch, normally open
Description: /input_speed/
-receive keyboard input of numbers to change speed

Input data item: Change speed button
Acronym: /button_change_speed/
Hardware: Momentary switch, normally open
Description: /button_change_speed/
-change robot speed to speed currently in /input_speed/
Data Representation:
Byte 3 is Motor/Motor combinations
Bytes 4-9 is the new speed

Input data item: Get connection button
Acronym: /button_get_connection/
Hardware: Momentary switch, normally open
Description: /button_get_connection/

-transitions from *No Connection* to *Awaiting Connection*

Input data item: End connection button
Acronym: /button_end_connection/
Hardware: Momentary switch, normally open
Description: /button_end_connection/
-transitions from *Normal Operation* to *No Connection*

Input data item: Message received from robot
Acronym: /input_message/
Hardware: Communications link (bluetooth)
Description: /input_message/
-message sent from the robot

Outputs

Output data item: Message sent to the robot
Acronym: //output_message//
Hardware: Communications link (bluetooth)
Description: //output_message//
- encodes commands for the robot to complete based on user input
Characteristic of values: encoded based on communication specification; 10 character message

Output data item: Light sensor output
Acronym: //sensor_light//
Hardware: LCD monitor
Description: //sensor_light//
- display most recently read value from light sensor
Characteristic of values: Strings

Output data item: Sound sensor output
Acronym: //sensor_sound//
Hardware: LCD monitor
Description: //sensor_sound//
- display most recently read value from sound sensor
Characteristic of values: Strings

Output data item: Touch sensor output
Acronym: //sensor_touch//
Hardware: LCD monitor
Description: //sensor_touch//
- display most recently read value from touch sensor
Characteristic of values: Strings

Output data item: Ultrasonic sensor output
Acronym: //sensor_ultrasonic//
Hardware: LCD monitor
Description: //sensor_ultasonic//
- display most recently read value from ultrasonic sensor
Characteristic of values: Strings

Output data item: Display for messages from robot
Acronym: //data_log//
Hardware: LCD monitor
Description: //data_log//
- displays messages from robot
- displays error message from robot
Characteristic of values: Strings/sentences in textbox

Define Set of Events

Mode	Event	Action
Normal Operation	@T(/button_forward/ = $pressed$)	//output_message// = “MSF0000000” is sent
	@T(/button_backward/ = $pressed$)	//output_message// = “MSB0000000”
	@T(/button_left/ = $pressed$)	//output_message// = “TNL0000000”
	@T(/button_right/ = $pressed$)	//output_message// = “TNR0000000”
	@T(/button_left/ = $pressed$ AND /button_forward/ = $pressed$)	//output_message// = “MAFL000000”
	@T(/button_right/ = $pressed$ AND /button_forward/ = $pressed$)	//output_message// = “MAFR000000”
	@T(/button_left/ = $pressed$ AND /button_backward/ = $pressed$)	//output_message// = “MABL000000”
	@T(/button_right/ = $pressed$ AND	//output_message// =

	/button_backward/ = $pressed$)	“MABR000000”
	@T(/button_right/ = $pressed$ AND /button_left/ = $pressed$)	$NoOp$
	@T(/button_forward/ = $pressed$ AND /button_backward/ = $pressed$)	$NoOp$
	@T(/button_forward/ = $released$)	//output_message// = “ST00000000”
	@T(/button_backward/ = $released$)	//output_message// = “ST00000000”
	@T(/button_left/ = $released$)	//output_message// = “ST00000000”
	@T(/button_right/ = $released$)	//output_message// = “ST00000000”
	@T(/button_left/ = $released$ AND /button_forward/ = $released$)	//output_message// = “ST00000000”
	@T(/button_right/ = $released$ AND /button_forward/ = $released$)	//output_message// = “ST00000000”
	@T(/button_left/ = $released$ AND /button_backward/ = $released$)	//output_message// = “ST00000000”
	@T(/button_right/ = $released$ AND /button_backward/ = $released$)	//output_message// = “ST00000000”
	@T(/button_right/ = $released$ AND /button_left/ = $released$)	$NoOp$
	@T(/button_forward/ = $released$ AND /button_backward/ = $released$)	$NoOp$
	@T(/button_change_speed/ = $released$)	Send //output_message// based on /input_speed/
	@T(/button_sensor_ultrasonic/ = $released$)	//output_message// = “RS30000000”
	@T(/button_sensor_light/ = $released$)	//output_message// = “RS40000000”

	@T(%get_connection%)	$NoOp$
	@T(%end_connection%)	Go to *No Connection*
	@T(/input_message/ = “RS1~”)	//sensor_touch// = !reading!
	@T(/input_message/ = “RS2~”)	//sensor_sound// = !reading!
	@T(/input_message/ = “RS3~””)	//sensor_ultrasonic// = !reading!
	@T(/input_message/ = “RS4~”)	//sensor_light// = !reading!
	@T(%is_error_message%)	lookup error in !error_message_table! and display message on //data_log//
Awaiting Connection	@T(%connection_received%)	Go to *Normal Operation*
	@T(%time_out%)	Go to *No Connection*
No Connection	@T(%get_connection%)	Go to *Awaiting Connection*

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