MIPS ASSEMBLY FINALPROJECT REPORT

Project 4:Postscript CNC Marsbot

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**I>Problem statement and solution:**

**Problem to solve: *Problem 4***

**Problem statement:**

**Simulate a precisely metal plate cutting machine CNC Marsbot to cut a plate with an instruction given by a postscript with the condition: if the machine moving without cutting the plate then the Marsbot track condition is untrack.**

**Given an array of three elements: angle of movement,time of movement and state of movement(boolean value for track or untrack)**

**Write a program to control the CNC Marsbot to cut the plate as the postscripts and the user can choose 1 from 3 given postscripts by press 0,4 or 8 on the digital labsim keyboard. (1 of them must be draw the DCE figure)**

**Solution:**

**1)Define the address for using Marsbot and Digital LabSim:**

\*For Marsbot:

.eqv HEADING 0xffff8010 # int : An angle between 0 and 359

.eqv MOVING 0xffff8050 # bool : Whether or not to move

.eqv LEAVETRACK 0xffff8020 # bool : (0 or non-0) whether or not to leave a track

.eqv WHEREX 0xffff8030 # int : Current x-location of MarsBot

.eqv WHEREY 0xffff8040 # int : Current y-location of MarsBot

\*For Digital LabSim:

.eqv IN\_ADRESS\_HEXA\_KEYBOARD 0xFFFF0012 #input address of lab sim

.eqv OUT\_ADRESS\_HEXA\_KEYBOARD 0xFFFF0014 #output address of lab sim

**2)Design the 3 postscripts for the problem:**

-First postscript : DCE figure:

The postscript have 21 cuts and it is:

115,3000,1,145,3000,1,155,3000,1,180,3000,1,205,3000,1,215,3000,1,245,3000,1,0,16000,1,90,14000,0,245,5000,1,200,7000,1,160,7000,1,115,5000,1,90,3000,0,90,5000,1,270,5020,0,0,8000,1,90,5000,1,270,5020,0,0,8000,1,90,5000,1

-Second postscript: VN with a star shape figure:

The postscript have 14 cuts and it is:

90,2000,0,162,8000,1,306,8000,1,90,8000,1,234,8000,1,18,8000,1,90,5000,0,162,8000,1,18,8000,1,90,2000,0,180,8000,1,0,8000,0,162,8300,1,0,8000,1

-Third postscript: Random pattern I want to draw:

The postscript have 14 cuts and it is:

180,2500,1,45,3500,1,135,3500,1,45,3500,1,135,3500,1,0,2500,1,270,10000,1,135,3500,1,45,3500,1,135,3500,1,45,3500,1,180,2500,0,270,10000,1,0,2500,0

-At the initial, I will assign these postscripts to 3 different arrays by Scripts1,Scripts2,Scripts3

**3)Move the Marsbot from the corner to start draw as the postscript instructions:**

-Firstly I call the rotate procedure and assign a 135 degree corner for moving to the middle and then call the untrack procedure for the bot not to leave a track when it is moving. Secondly, I will call the go procedure for the bot to start going and by that time, the sleep syscall will be call for the Marsbot to keep going in sleep mode and then lastly the stop procedure will be call to make the bot stop and wait for the next procedure.

-Used registers:

#$v0:syscall

#$a0: angel of movement,variable for procedure to execute

-Used procedure from Marsbot:

#untrack

#rotate

#go

#track

**4)Check the input postscripts:**

-Since we have 3 different postscripts and one of them will be trigged by press the corresponding button on Digital LabSim: 0 for the first,4 for the second and 8 for the last.

-Now I will call the check\_digital\_input procedure:

+I assign the 2 .eqv address of Digital LabSim to $t1 and $t2 then read the value of output to $a0

+If $a0 = 0x11 => 0 pressed =>exit from loop

+If $a0 = 0x12 => 4 pressed =>exit from loop

+If $a0 = 0x14 => 8 pressed =>exit from loop

+I use polling in this procedure: to check if the 0 or 4 or 8 or other buttons pressed by user:

+If 0 is pressed => load address of Scripts1 to $s0 and 21 cuts to $t5

+If 4 is pressed => load address of Scripts2 to $s0 and 14 cuts to $t5

+If 8 is pressed => load address of Scripts3 to $s0 and 14 cuts to $t5

+If others => keep checking by polling

+After each loop, the sleep syscall will be call for the program to sleep in 100ms befor the next loop

+The output of this procedure will be the address of chosen postscript and corresponding steps

-Used registers:

#$a0:value of output

#$s0 :hold the address of choosen postscripts

#$t1 :input address

#$t2 :output address

#$t3 :number of row

#$t5 :number of step of that postscripts

**5)Control the MarsBot to draw as postscript:**

-After check\_digital\_input procedure we now have the postscripts and number of steps to draw, I will use a loop here to control the marsbot

for(steps = $t5;steps > 0; steps--){

$s1 = angel of movement = 0($s0);

$s2 = time of movement = 4($s0);

$s3 = state;

if(state == 1){

track();

}else{

untrack();

};

$a0 = $s1;

rotate($a0);

go();

sleep syscall($s2);

$s0 = $s0 + 12; #ready for next loop

}

-After the loop, the stop procedure will be call and then jump to end\_main to terminate program with terminate syscall.

**II>Used data structures and algorithms,tools:**

**Data structures**: array

**Tools**: Digital LabSim,Marsbot

**III>Descriptions for procedures and used resgisters: In the source code**