

RoboRugby 2010

Robotics Design Project
EEEN 10020

Lecture 4 - Servo, Finding Balls...



UCD School of Electrical,
Electronic and Mechanical
Engineering

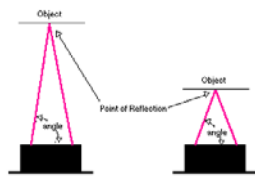
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Meicniúla UCD

Servo Actuator

- Control angle / position
 - range ~200°
 - ~1 s end-to-end
 - torque ~0.3 Nm
- Connect to Handyboard
 - servo pins - port 0
 - right way around!!
- Initialise:
 - `init_expbd_servos(1);`
- Use: global variable
 - `servo0 = 1000;`
 - range ~600 to ~4000
 - experiment...



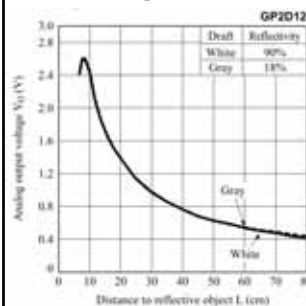
Distance Sensors



- Emit pulses of infra-red light at 1 ms intervals
- Pick up reflected light from object in beam
- Get distance to object from angle of arrival
- Range 10 to 80 cm, very narrow beam
- Outputs voltage related to distance



Using Distance Sensors



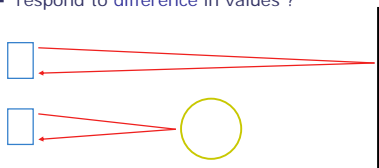
- Must connect to Handyboard port 4 or 5
- analog(4) or analog(5) gives number proportional to voltage
- Voltage is related to distance as shown
- Ambiguous for near objects...
- Some random variations in output - don't make decision on one reading!



Finding a Ball



- One distance sensor:
 - cannot distinguish ball, robot, wall
- Two distance sensors:
 - mount side-by-side or one above the other
 - ball is small - seen by one sensor only
 - respond to difference in values ?



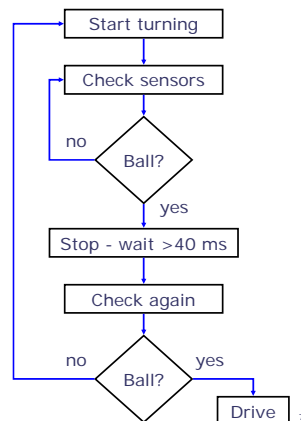
Ball-Finding Algorithm

- Basic idea:
 - turn robot, looking for ball
 - if ball **found**, drive towards it
- Ball found ?
 - lower sensor shows close object, upper does not ?
 - significant **difference** in sensor values ?
- Random variations in sensor output
 - don't take action on one report
 - if think ball found, wait and check again ?
- Slow sensor response - update every 40 ms
 - spin robot slowly to avoid missing ball
 - consider turning a bit and stopping to look ?



Ball-Finding

- Simple algorithm
 - only precaution is second check before driving
- Add timeout
 - no point turning forever
 - drive off at random?



This week...

- Before lab on Wednesday:
 - read web page on distance sensors
 - read web page on servo
- Review programming concepts
 - many teams still having difficulty with basics!
 - some help in tutorial today...
 - common problems
 - how to find problems
 - get more help in lab if needed!
- Team meeting - decide on strategy
- Choose team name
- Write strategy report - due 3pm Wed 17 Feb.
 - penalties for late submission



Strategy Report

- Brief report on strategy design process
- Strategy:
 - what should your robot do to win ?
 - options considered, strengths, weaknesses, risks...
 - option(s) chosen, and why...
 - what strategy might beat yours?
 - what could go wrong?
 - what if the other robot had the same strategy?
- Want to see:
 - evidence of design process
 - thinking about what might go wrong
 - some sensible decision



Strategy Report - Details

- One report per team
 - typed report - submitted on paper
 - presentation not too important (yet)
 - diagrams or sketches can be hand-drawn
- Guideline length approx. 3 A4 pages
 - long enough to include all essential information
 - no padding - if it all fits in 2 pages, stop!
- Include identification on first page
 - team number, team name, student names
 - download template from web site – sessions page
- Submit at start of lab, Wednesday 17 February



Technical Writing (more later)

- Think of the Reader
 - who will read this document?
 - what does the reader need or want from it?
- Structure
 - organise in sections, to suit reader
 - heading on each section - helps the reader
- Style of writing
 - be yourself - everyone has individual style, but...
 - be clear and concise - no long rambling sentences!
 - use reasonably formal, consistent style
 - distinguish between opinion and fact



Module Grade - Proposal for 2010

- Team Effort: 45%
 - design & performance of robot 15%
 - quality of competition program 15%
 - challenge reports: 2 + 2 + 3 + 3 = 10%
 - strategy report (due week 5) 5%
- Individual Effort: 55%
 - interim report (due week 8) 20%
 - short presentation (week 10) 5%
 - final report (due week 12) 30%
- Team effort grades adjusted by contribution
 - team members need not get equal share

