



Electronics Presentation

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ROBOTICS

- What do you need?
- What you will get
- Features and functionality
- Custom electronics & extending functionality
- Dispatching the kit



What do you need?

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- What functions might you want your robot to perform?

In pairs discuss how you might:

- find balls?
- know what colour a ball is?
- collect balls?
- move around?
- avoid the arena walls?
- know where you are?
- know where your opponents are?
- deposit balls?



What will you be given!

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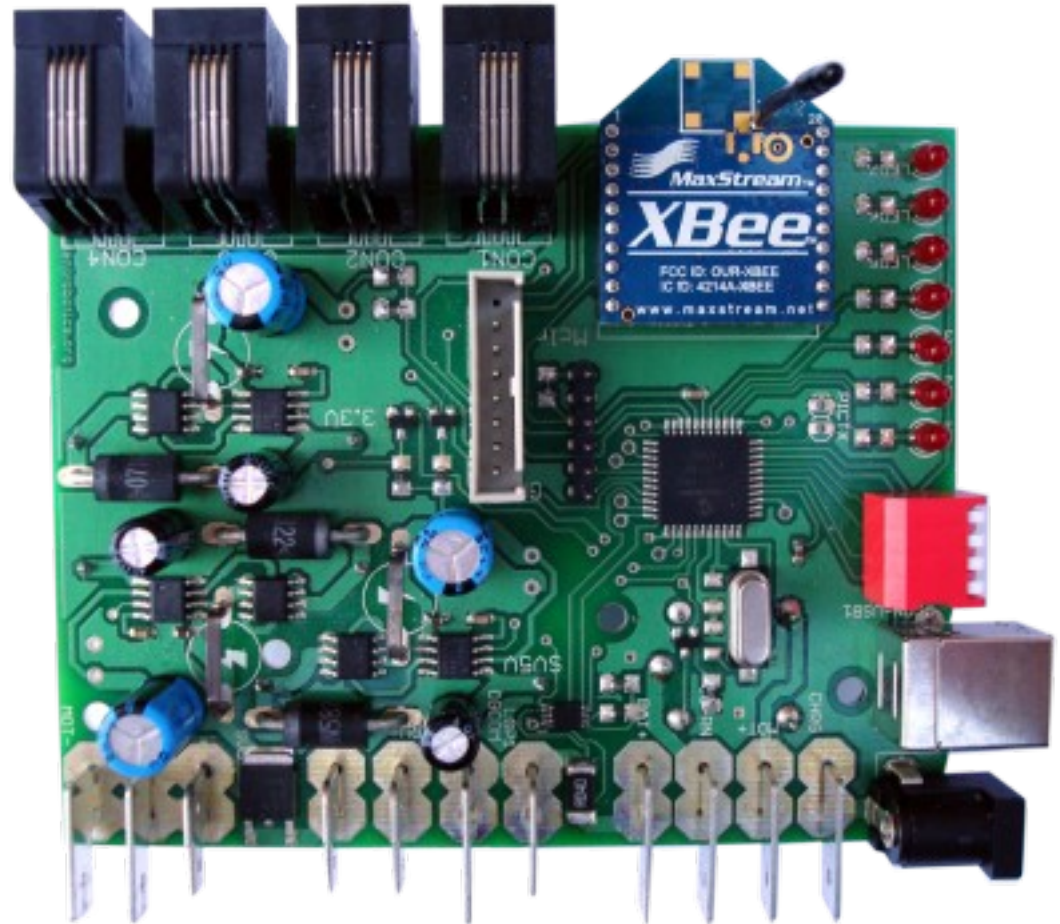
- The student robotics kit consists of 4 custom made boards
 - Power Board
 - PWM (Servo) Board
 - Motor Board
 - Joint-IO Board
- And a few extras
 - Web camera
 - SLUG (the CPU)
 - Battery, cables, connectors etc.



The Power Board

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- Supplies power to all of the boards
- Has data lines to all of the boards
- Radio module for remotely starting the games
- USB Hub

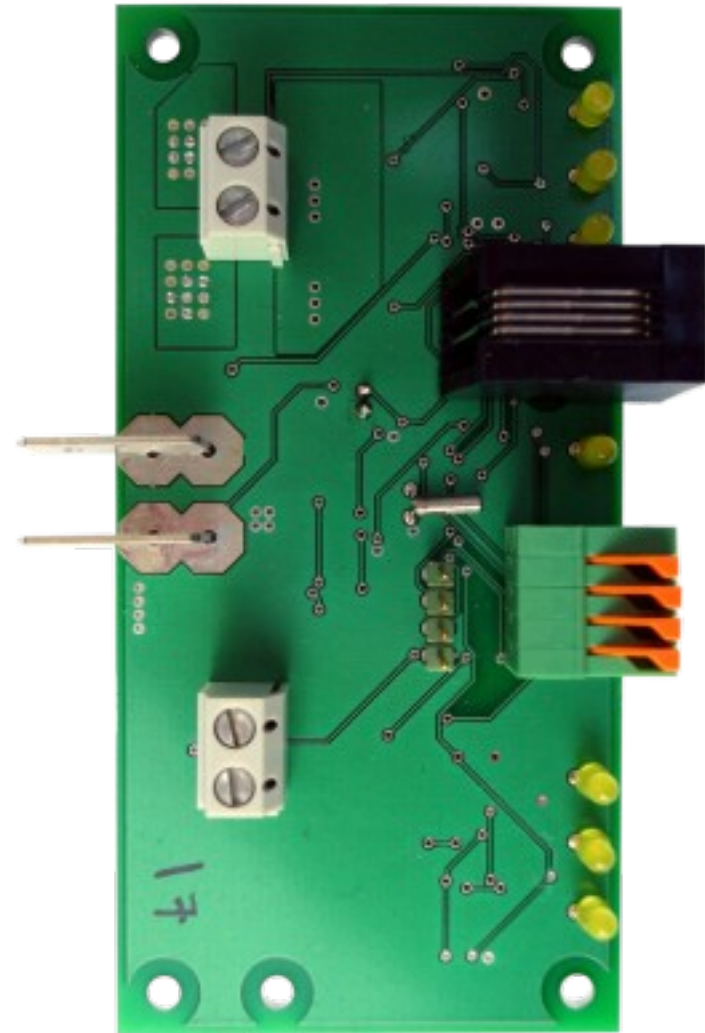




The Motor Board

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- Control the speed and direction of up to two DC motors
- Optional motor feedback

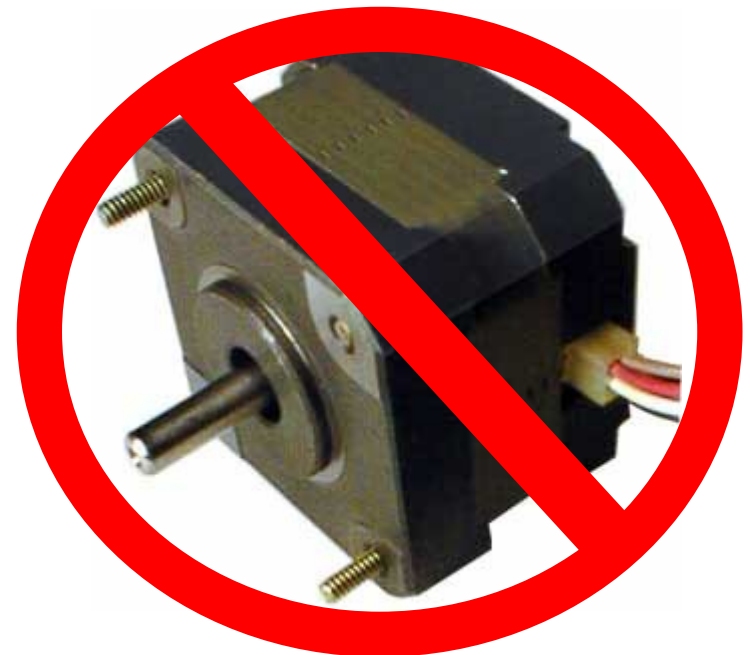




Moving around

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- DC Motors
 - Must be 12V DC motors
 - Motor board doesn't support Stepper motors
 - Motor board cannot drive AC motors

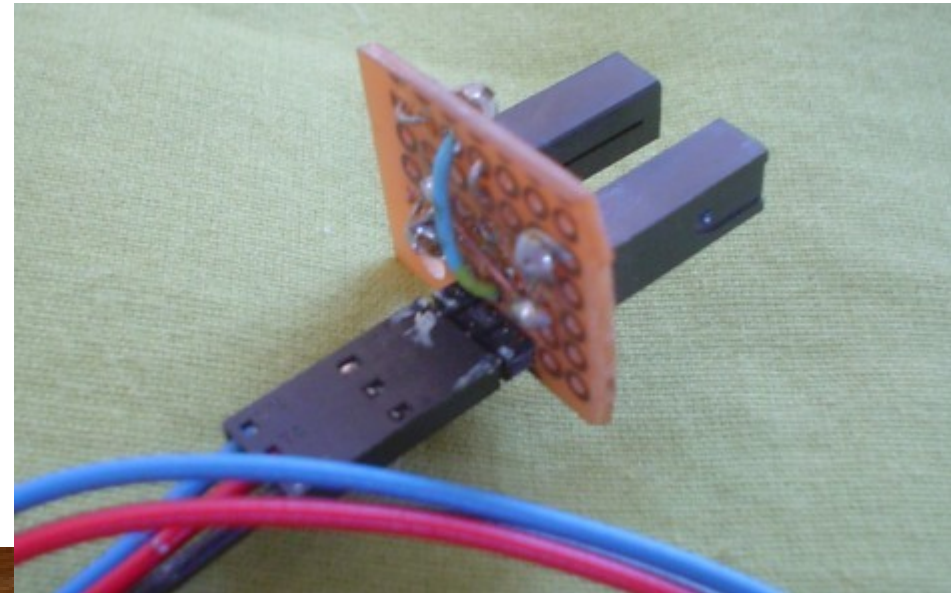




Motor Feedback

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- Rotating slotted disc breaks a simple light gate
- Count the interruptions to work out the speed





Knowing where you are

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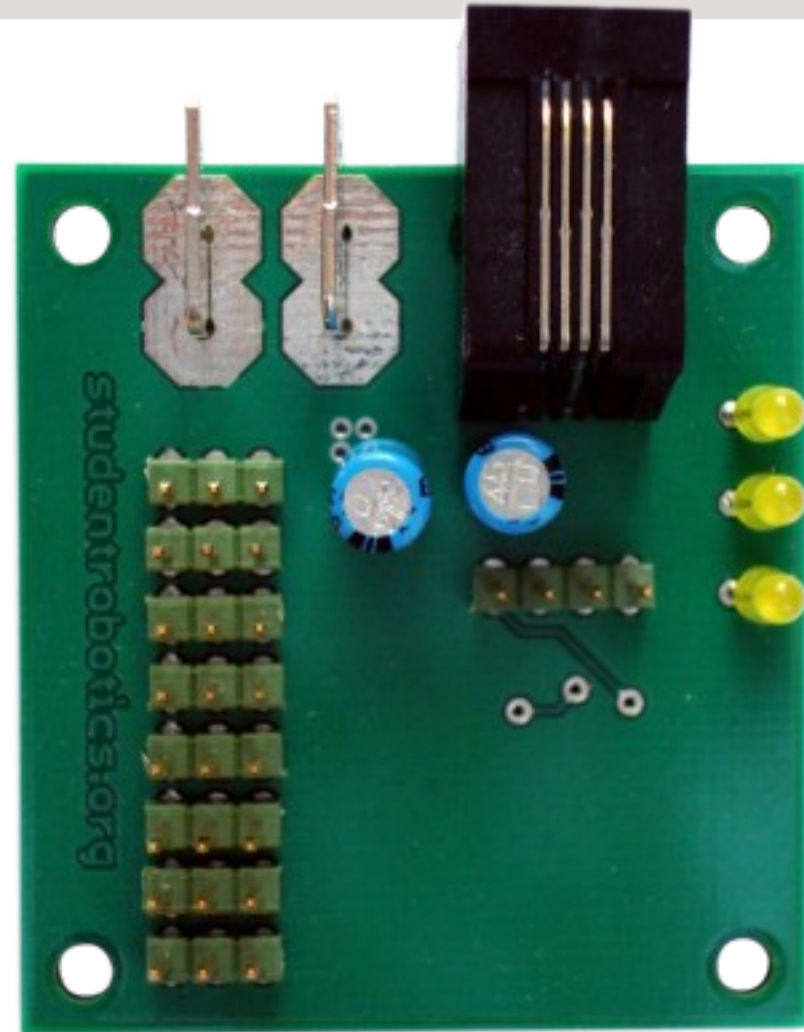
- Why bother with motor feedback
- 'blind' speed control
- Wheel slipping
- The wall





The PWM Board

- Control the position of up to 5 servos (independently)





Moving things

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- Servos
 - Easy to connect to the PWM Board
 - Perfect for slow but high precision movements
 - Simple to program





The Joint-IO Board

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- Connect a maximum of 8 digital or analogue input devices
- Connect a maximum of 4 digital output devices





Analogue versus Digital

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- Analogue
 - An analogue signal is one which varies within a range of values.
 - Infinite number of input values
 - Example: output from a light sensor
- Digital
 - A digital signal has a limited number of possible input values.
 - A single digital input (1 bit) has only 2 possible values (1/0)
 - Example: output from a switch (on/off)



Digital Inputs

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- Mechanical switches
 - Easy to connect to the Joint-IO Board
 - Bump sensors or position sensors
- Tilt switches
 - Detect changes in angles
- Reed (magnetic) switches
 - Detect nearby magnets





Analogue Input

- Rotary variable resistors
 - Easy to connect to the Joint-IO Board
 - Useful for measuring angular positions
- Photocells
 - With little extra circuitry you could build a colour sensor





Digital Outputs

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- Motor switching
 - Using Bipolar/FET transistors
- Electromechanical devices
 - Relays
 - Solenoids
- Optical devices
 - LEDs
- Audible devices
 - buzzers?

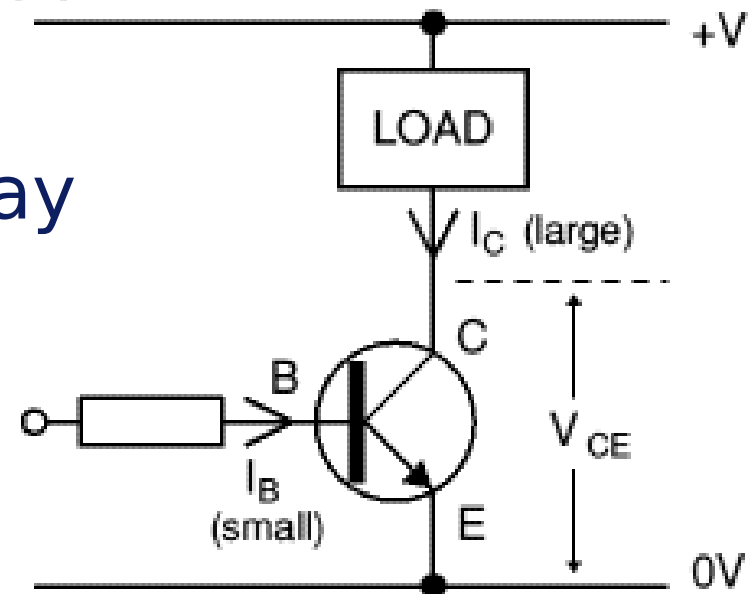




Switching

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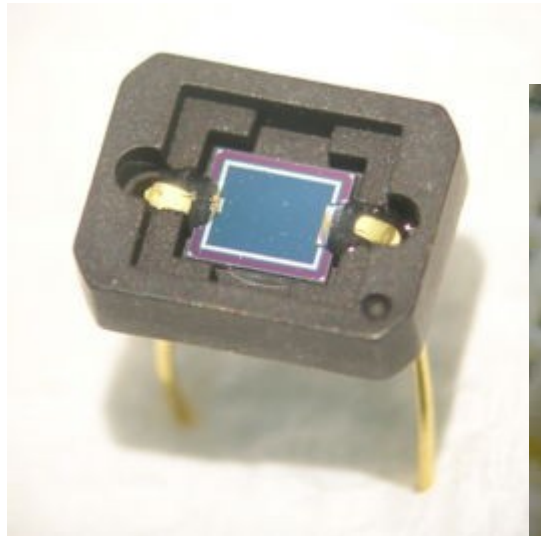
- What if two motors is not enough?
 - Use joint IO output to turn on a transistor
 - Transistor then switches on a larger current to the target device (motor)
 - You can use bipolar/FET type transistors
 - Cheap and Easy
 - Faster switching than relay
 - See website for info





Finding things

- Optical sensors
 - Easy to connect to the Joint-IO Board
 - Detect/follow lines





Where to buy?

- You will be given a budget to spend on mech and elec kits
 - You can spend it anywhere
 - But we recommend the following:
 - Farnell [farnell.co.uk]
 - Maplin [maplin.co.uk]
 - RS [uk.rs-online.com]
 - School departments





Vision

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- A Web Camera
 - Can spot blobs of colours (e.g. balls and zones)
 - Could be used





The fifth board....perhaps, maybe

- A Screen for your robot
 - View important information (real time)
 - Vision system output
 - Battery information
 - Error messages
 - Debugging code
 - Lots more...





Is that all?

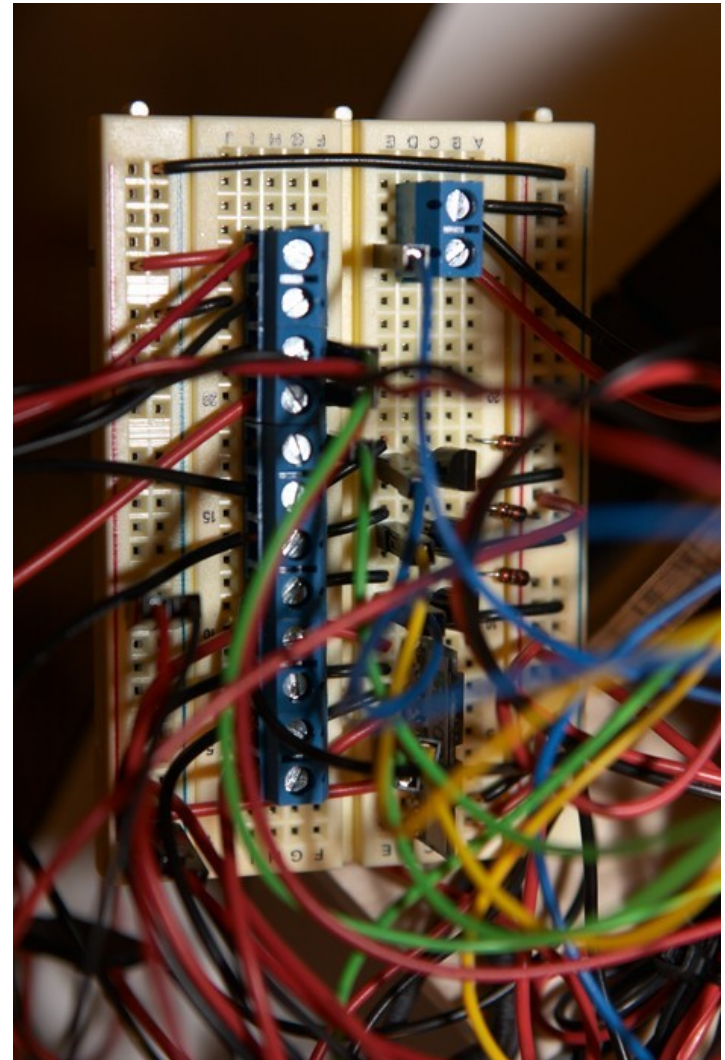
- You are encouraged to build your own electronics too
- Don't be afraid to try out new ideas
- Use the website to find out more about the kit
- Ask your mentors
- Start early!





Restrictions & Guidelines

- Wiring rules
- Help and fact sheets will be available from the website
- All devices must be powered from the power board
- We cannot replace boards





Electronics Dispatch

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- When will the electronics be ready?



Any Questions?

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Thank you for your attention