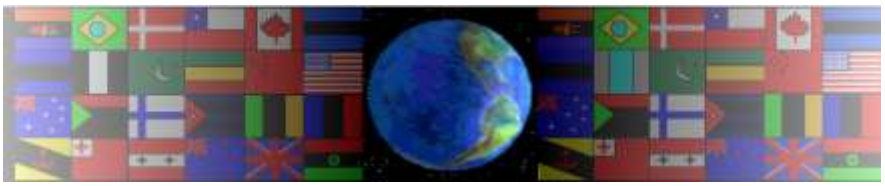
INDIVIDUAL RESEARCH SHEETS

On behalf of The World Association of Technology Teachers

W.A.T.T.



World Association of Technology Teachers

This exercise can be printed and used by teachers and students. It is recommended that you view the website (www.technologystudent.com) before attempting the design sheet .

INDIVIDUAL RESEARCH

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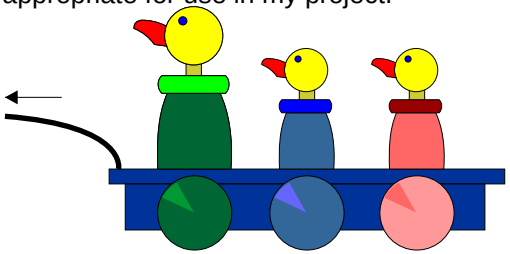
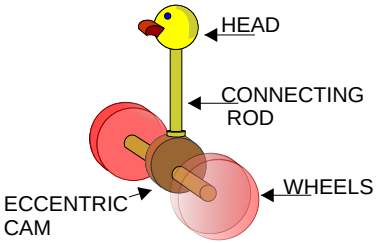
CAMS AND GEARS

PRODUCT: MECHANICAL CHILDS TOY

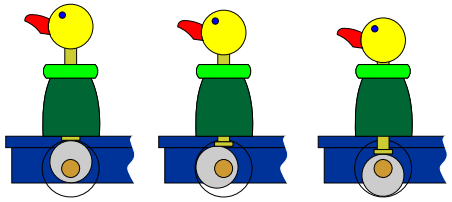
I am researching a range of mechanisms for my mechanical toy/game. I will select the most appropriate for use in my project.



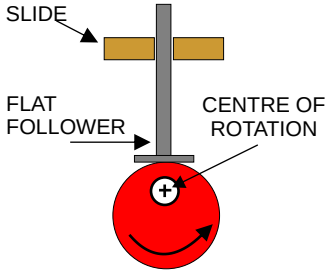
This mechanical toy is based on a cam mechanism. As the toy is pulled along the heads of the 'ducks' move up and down.



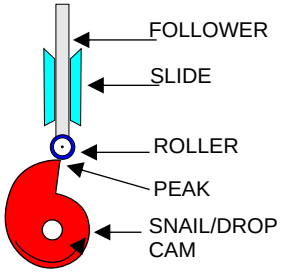
As the toy is pulled along by a child, the eccentric cam rotates as it is fixed to the axle and the wheels. The heads and connecting rods move up and down as the axle and eccentric cam revolve.



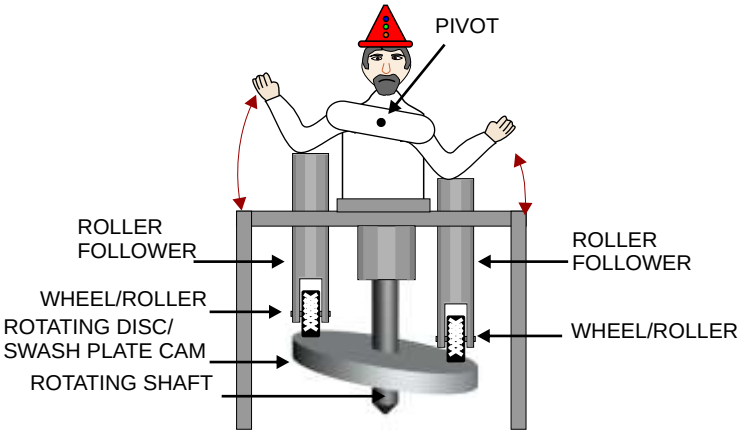
This diagram shows the various positions of the eccentric cam as it rotates.



Opposite, is a simple diagram of an eccentric cam. I could use this design in my mechanical toy/game.
Eccentric cams are easy to manufacture as the profile can be cut from a piece of large diameter dowel rod or even a floor brush handle.



Snail/Drop cam. When rotating for one complete revolution the follower stays level for approximately the first 120 degrees. The follower then rises slowly and suddenly drops when it reaches and passes the peak.
This is a useful cam if a sudden action is required. I could apply this cam to my mechanical toy.



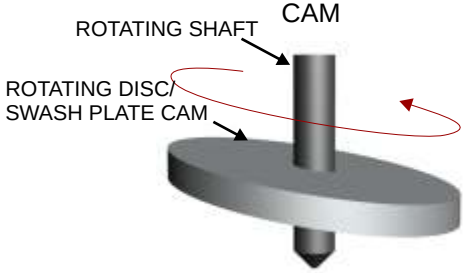
The mechanical display above is a dancing puppet. As the swash plate cam rotates the two roller followers rise and fall. This motion makes the puppet look as if it is dancing / waving its arms. The cam mechanism would normally be 'boxed in' for safety reasons.

The two main parts of the swash cam device are drawn below.

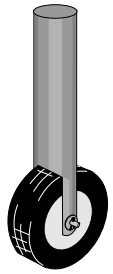
The swash plate has a central rotating shaft around which it rotates. The plate is set at an angle.

The roller follow simply moves up and down as the angles plate rotates.

SWASH PLATE CAM



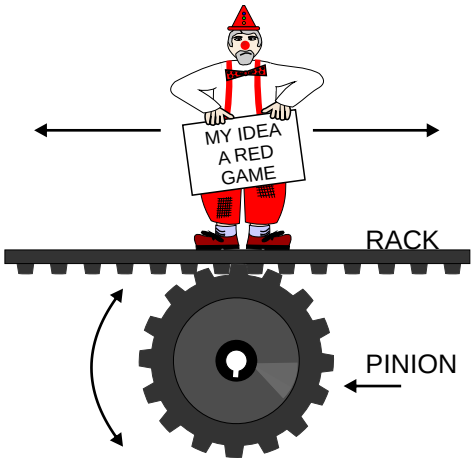
ROLLER FOLLOWER



The swash cam has a significant advantage over other cams, a single plate can have a large number of roller followers arranged on its surface. This means that the final mechanism of the game/toy could control many of moving parts.

My mechanical toy/game could use this type of mechanical device as it is relatively easy to make. Also, swash cams are very smooth, if made accurately and they are less likely to jam or stick than other types of cam.

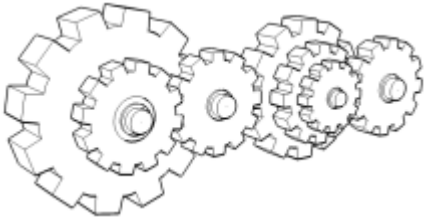
RACK AND PINION GEAR SYSTEM



The rack and pinion gear system drawn above, could be applied to a mechanical toy/game. As the pinion gear wheel rotates in a clockwise direction, the rack gear moves to the right, and so does the model fixed to the top. If the pinion rotates anticlockwise the rack and model moves to the left.

GEAR TRAINS AND COMPOUND GEARS

I will consider using a gear system such as the gear train seen below. If I use a motor or a handle to produce movement for my toy/game, a gear system will allow me to control and vary the speed.



Any part of my toy/game that rotates may need a gear box. I could build my own gear box from individual plastic gears or buy a small scale plastic gear box as a unit.

Although this may add complexity to my design, it may make my toy/game more interesting and realistic to use.

I am researching a range of electronic components and circuits that could be useful for my security device project.

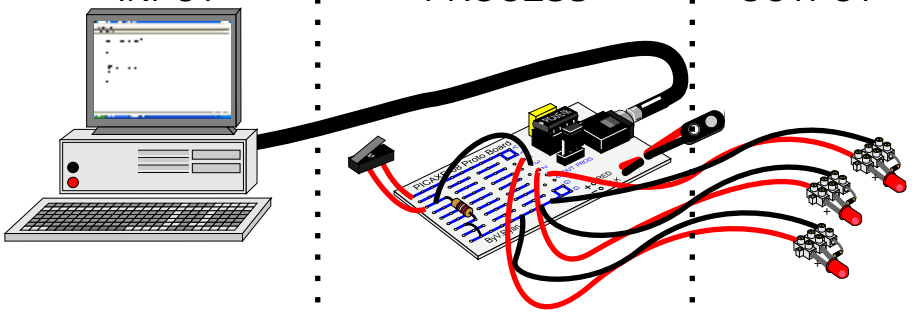
INDIVIDUAL RESEARCH

PRODUCT: SECURITY DEVICE

ELECTRONICS - INPUTS - PROCESSING AND OUTPUTS

Most security devices depend on a PIC Microcontroller, programmable circuit. This type of circuit could be used in my project, as PICs can be reprogrammed any number of times. Basic PIC Microcontrollers are relatively cheap and reliable. I intend to programme my PIC Microcontroller so that an INPUT such as a light sensor or pressure pad or micro-switch will detect movement and then activate security shutters and an alarm, plus flashing lights.

INPUT | PROCESS | OUTPUT



I will use a computer and software to programme the microcontroller. I will simulate the programme on screen so that obvious faults can be corrected.

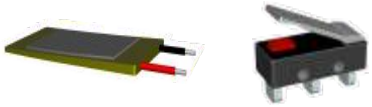
When I am happy with the programme, I will download it to my PICAXE circuit, ready for use.

I will consider using LEDs, motors and sound outputs with my circuit / security device.

INPUT COMPONENTS

These are possible input components I could use with my security device

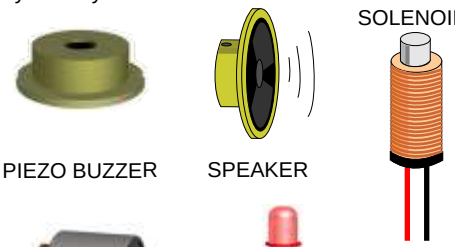
THERMISTOR | TOGGLE SWITCH | LIGHT DEPENDENT RESISTOR



PRESSURE PAD | MICROSWITCH

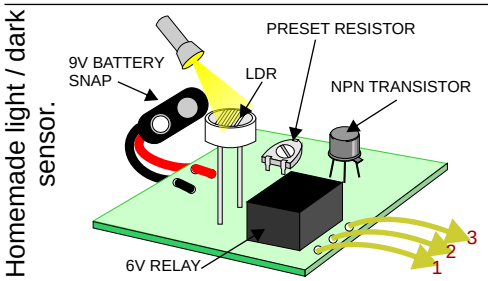
OUTPUT COMPONENTS

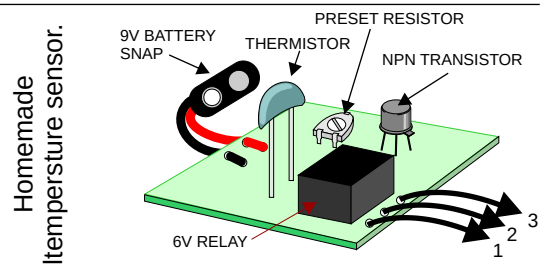
These are possible output components I could use with my security device



PIEZO BUZZER | SPEAKER | SOLENOID

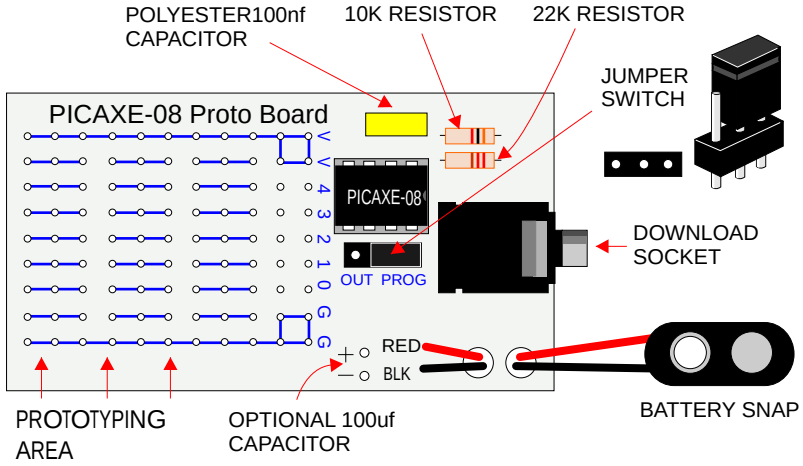
MOTOR | LED



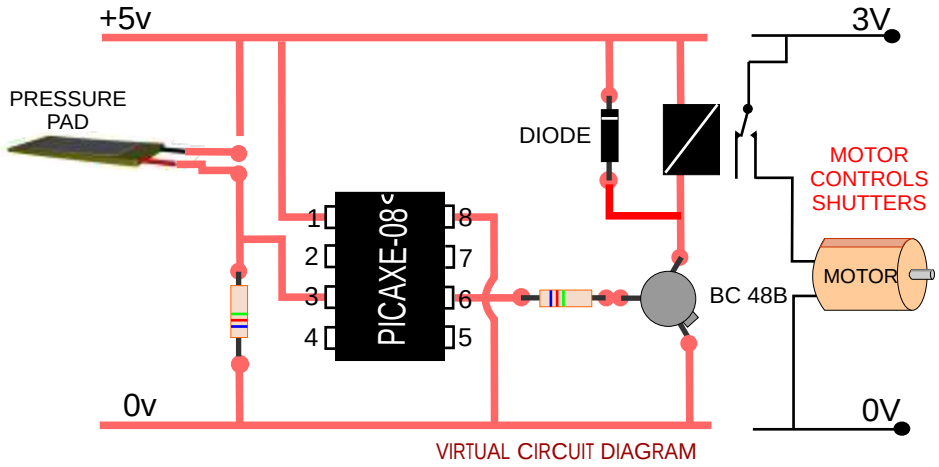


The PICAXE-08 Starter Pack may be suitable for my project as it has a limited number of inputs/outputs. The pack includes a PCB and all the components needed to manufacture a programmable circuit with 5 inputs/outputs.

PLAN / BIRDS EYE VIEW OF A PICAXE-08 PROJECT BOARD



PICAXE-08 CIRCUIT DIAGRAM



The circuit above shows how both input and output devices can be connected to the PICAXE-08.
The example circuit is for my security device. When an intruder stands on the pressure pad close to the front door, the PICAXE microcontroller detects an input. The programme within the microcontroller then outputs at pin 6, energising a relay. This allows a second circuit to turn on a motor, that closes security shutters at the windows and doors.