

# Build a Walking Robot

by Kieron McGeever

(Well, it makes me laugh!)

When talking about robots the first thing to come to mind is the android, a copy of the human form. Most science fiction and popular media robots take on this shape, but it is only just recently that successful walking robots have been designed.

## Techno Games

TEP supports the BBC Techno Games series, which is all about the designing of a whole range of specialist robots, most of which look nothing like the human form; perhaps only Skeletron comes close. Even the so called walking/running robots used in the sprint have multiple “legs” that propel them along and look nothing like real or imaginary creatures. So how do you make your own walking humanoid type robot?

## Joints, the human kind

In the BBC Techno Games robot resource pack there is information on how to make a mechanism that simulates walking, but, if you try to use it for walking, it does not work. This is because the legs do not have any feet, and just putting feet on the ends of the legs will not help because they do not have any joints.

Reading an article in the Real Robots magazine, I discovered that the Japanese electronics and engineering company, Honda, did a lot of research into how humans walk when they were designing their famous walking robot, P3. Surprisingly, they found that the most important joint is not the toes, but the ankle. Knees are also desirable as they act as shock absorbers and hips help to keep a robot in balance when turning. I wish I had read this article before I started experimenting with toes.

## Building a Walking CD

To start building a walking robot, construct the basic configuration shown in **fig 1**. This uses a three-hole plastic disc out of the robotics pack or you could use an old CD if you have one.

The whole layout is shown in **fig 5** (note, the spacing for the Clunk Click gear box mounting can be taken from the gearbox its self). The main axle should be as near as possible to the centre of the disc as is practical and positioned so that the battery box can be positioned under it.

The axle needs to be trimmed off to just short of the leg holes in the disc (**fig 3**).

The gearbox should be mounted using four 20mm machine screws and twelve nuts. Use double nuts to space it above the disc to provide clearance for the cams (**fig 4**). Two small egg cams are fixed to the motor axle 180 degrees out of phase (**fig 4**).

The legs and feet are made from the aluminium rod and two of the large egg cams. Cut and bend the legs to the sizes shown in **fig 5** and fit two short ankle lengths into the small end of the cams.

The feet are attached to the legs with the special rubber tube to give flexible ankle joints and the base of the feet have short lengths of rubber band stuck to them with double sided sticky tape for extra grip.

The battery box is fitted under the motor with double sided sticky pads and the battery snap and leads are connected to the motor. Experimentation may be needed to find the best direction of rotation for the motor before soldering them permanently in place. A further refinement might be an on/off switch; otherwise you can just connect and disconnect the battery.

Finally the front balancing leg is made from a 12mm nut and machine screw with a suitable length of polythene tubing attached to it (**fig 1**).

Now switch it on, put it on a smooth surface and see if you can resist smiling.

**The challenge is can you smooth out its walking action? Suggestions, please, to [mac@cercot.demon.co.uk](mailto:mac@cercot.demon.co.uk).**

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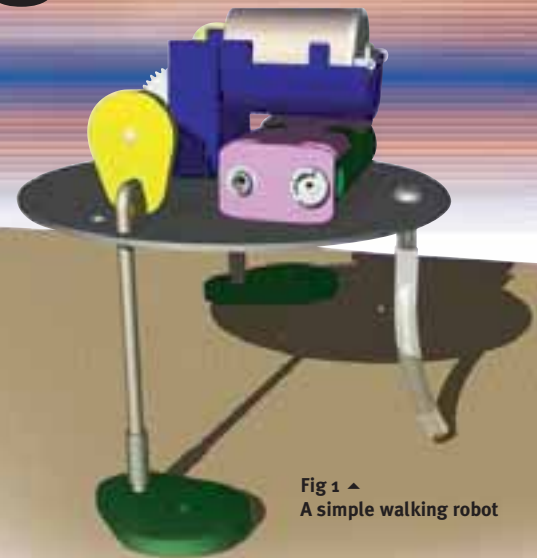
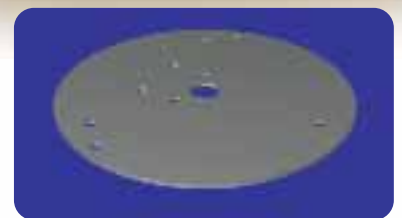


Fig 1 ▲  
A simple walking robot



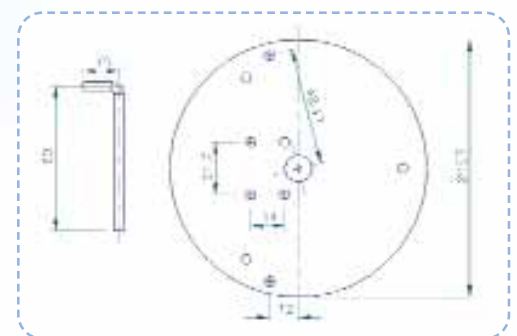
▲ Fig 2. Plastic disc base



▲ Fig 3. Clunk Click Gearbox fitted



▲ Fig 4. Egg Cams added



▲ Fig 5. Layout and measurements