**Using Tracker – modelling exoplanet detection**

This document assumes you have worked **through *Analysing linear motion using Tracker*** and can launch Tracker and import a video.

Exoplanets are planets in solar systems outwith our own. It is impossible using current technology to actually image most exoplanets but there are a number of ways of detecting them. Here we look at the transit method. Astronomers measure the light coming from a star over a long period of time and look for periodic dips in the irradiance. These can be caused by the transit of a planet between the star and the observer.

In our model, the star is a diffuser globe with a 12 V bulb inside.

The planet is a ball on the end of a string. The string is fixed to a point above the globe to form a conical pendulum when the ball is set in 'orbit' around the globe.
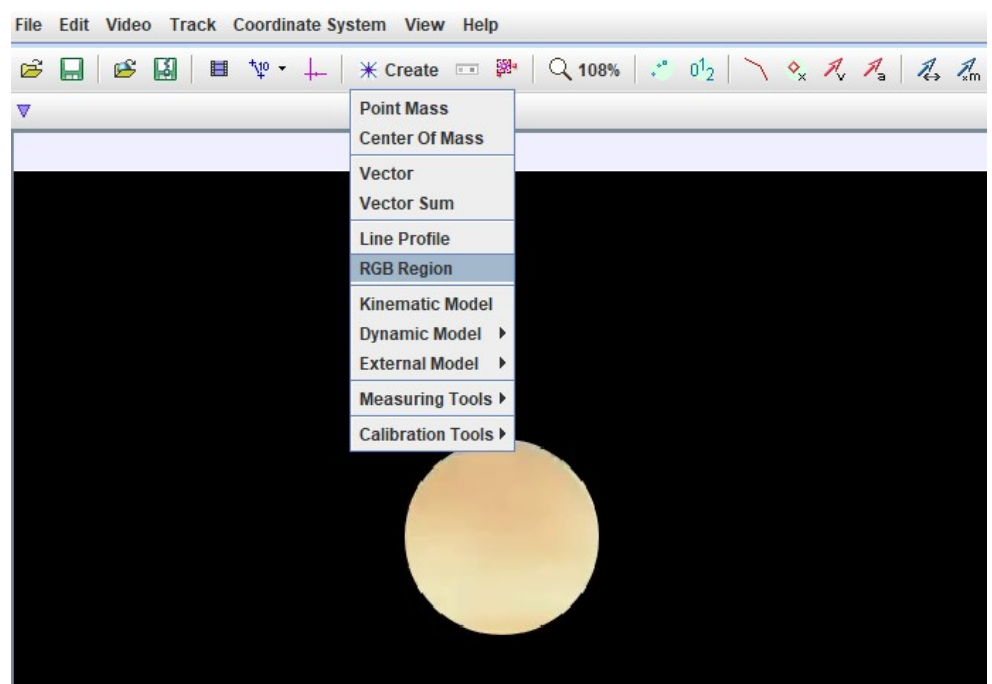
This is best done in a dark room with an uncluttered background. A video camera or phone is used to film the ball and globe as shown.

String with ball attached

Video camera

Diffuser globe with 12 V bulb inside
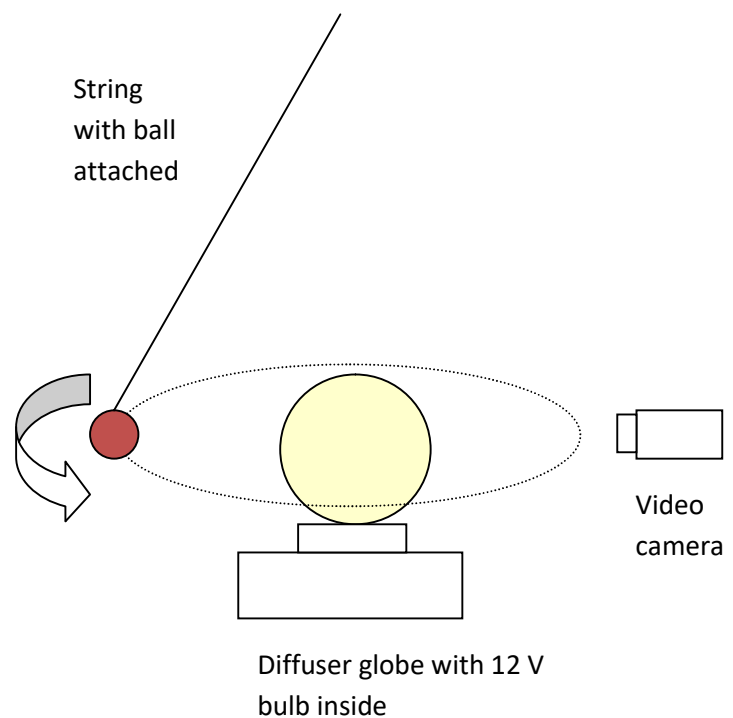
Launch Tracker and import the video *exoplanet.mp4*.

Note that we've used a video editor to mask out unwanted background features in our video.

Go to **Create** and choose **RGB Region.**

File   Edit   Video   Track   Coordinate System   View   Help

Q 108%

Create

Point Mass
Center Of Mass
Vector
Vector Sum
Line Profile
RGB Region
Kinematic Model
Dynamic Model   ▶
External Model   ▶
Measuring Tools ▶
Calibration Tools ▶

Shift+Click roughly in the centre of your 'star'. You should see a square marker surrounded by a small circle. You can change the position of the circle by dragging the square marker.
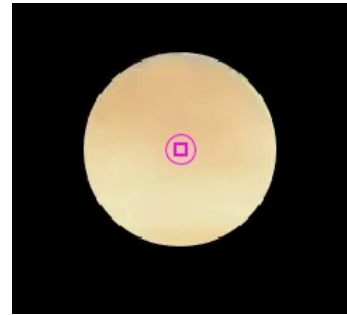
Tracker is going to record the 'pixel intensity' (measured in Luma) of the pixels within the circle. A black area would have a low pixel intensity. The pixel intensity in a white area would be high.

It would be good if we captured the light from our entire star. We need to increase the radius of the circle.

To do this, we can experiment with the value in **pixel radius** as shown.
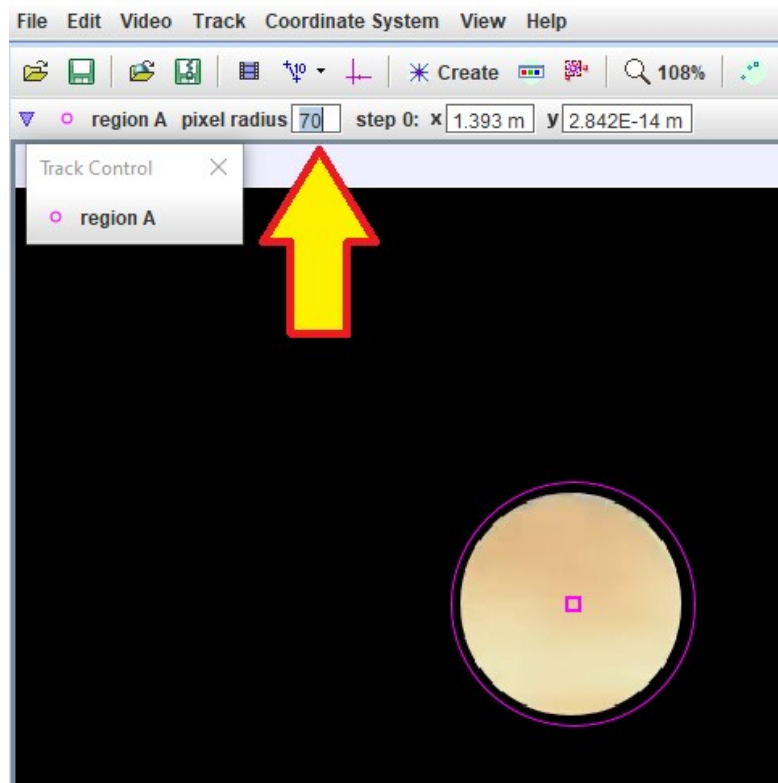
You can now click the green triangle (as indicated by the arrow) to play through your video or drag the slider. Either way you will generate a graph of pixel intensity with time. Each time the 'planet' transits, pixel intensity dips. This happens at a steady frequency, governed by the length of the string. The graph can be autoscaled or resized as before.