

Interactive Revision

Good revision of course is always interactive. When this project was first discussed the objective was to integrate traditional revision material with more interactive study made possible by using the features of Modellus.

The site produced is a first attempt at developing this idea. It contains past paper Physics questions from appropriate sources. In addition and crucially for us, Modellus models are associated with the questions to **encourage further exploration and discussion of the ideas being revised**. (Excel animations and exercises could also have been supplied but it was decided not to do this at this stage. Although I would like to see such models as the site develops.)

The questions can of course be used without referring to the models and the models can be used for mainstream teaching, not just for revision. I have found that using models to enhance the classic revision activity of “doing” past paper questions, can be a very positive experience. The students are focussed on a topic because of the exam threat and so often, great leaps can be made in understanding using the model as a stimulus.

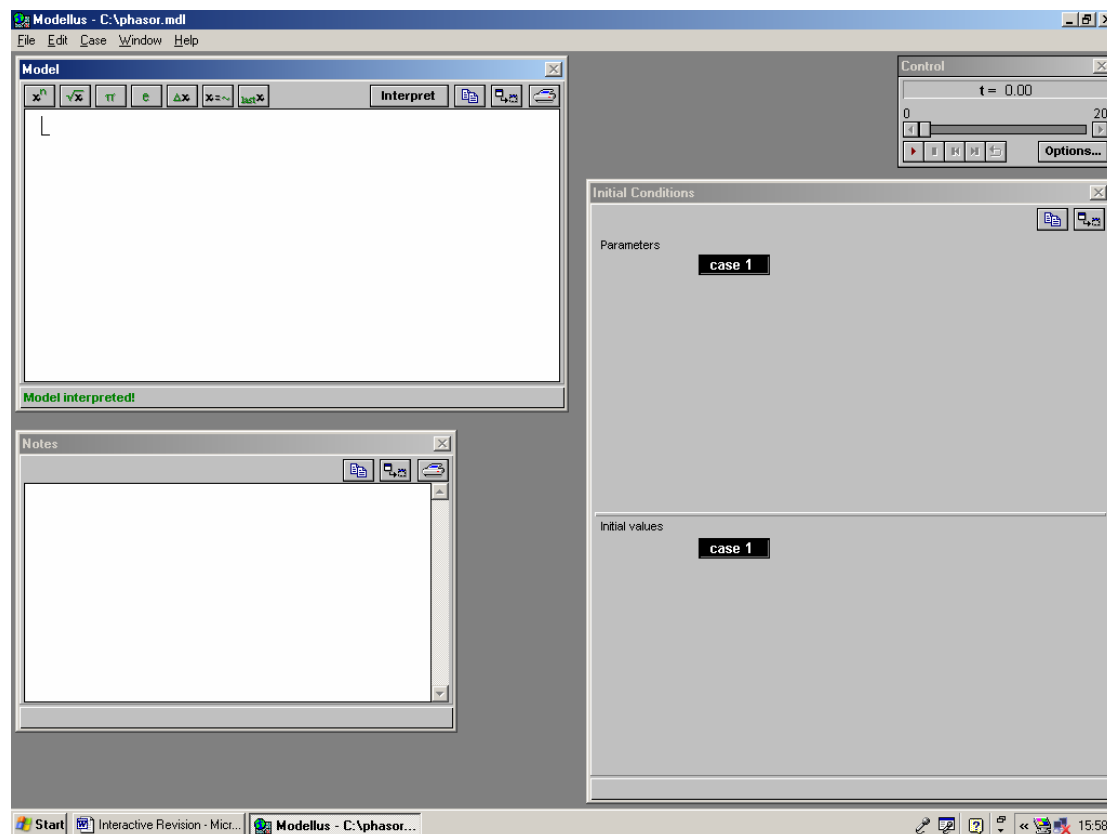
A word for Teachers

The models are supplied completely “open” for inspection. (All the windows are available for study.) Teachers should be aware that the models can be password protected (see tutorial below) before use and this enables one to hide the model window for example. Questions about the physics of the model, without the model window being available can be challenging, as can questions where students have to interpret the mathematical model structure. There is a lot of flexibility in this proposed approach to revision and time spent working with the model before allowing your students to play will pay dividends. Altering the worksheet to suit your teaching approach or to increase or reduce the challenge facing your students might be appropriate in some cases. I have used models in class to open revision of a topic before allowing the students to tackle the questions. I have set revision homework just on the model content. I have used the models in class to summarise a particular part of the course after students have tackled questions. There are many approaches. When using a model as a rule, I always make sure students produce some written output using the EDIT/Copy window function. They copy animation windows from models to enhance a written or numerical argument.

Getting going with Modellus

Colleagues sometimes ask how I get students writing models. I have a set 40 minute lesson, delivered around the time of Chapter 6 (Waves) in the AS course which gets over some basic ideas and can increase confidence in using Modellus. I will now outline this lesson.

The task is to produce a rotating arrow, phasor, whose properties we can control. Having achieved this then we can create many such objects to study waves and wave physics.

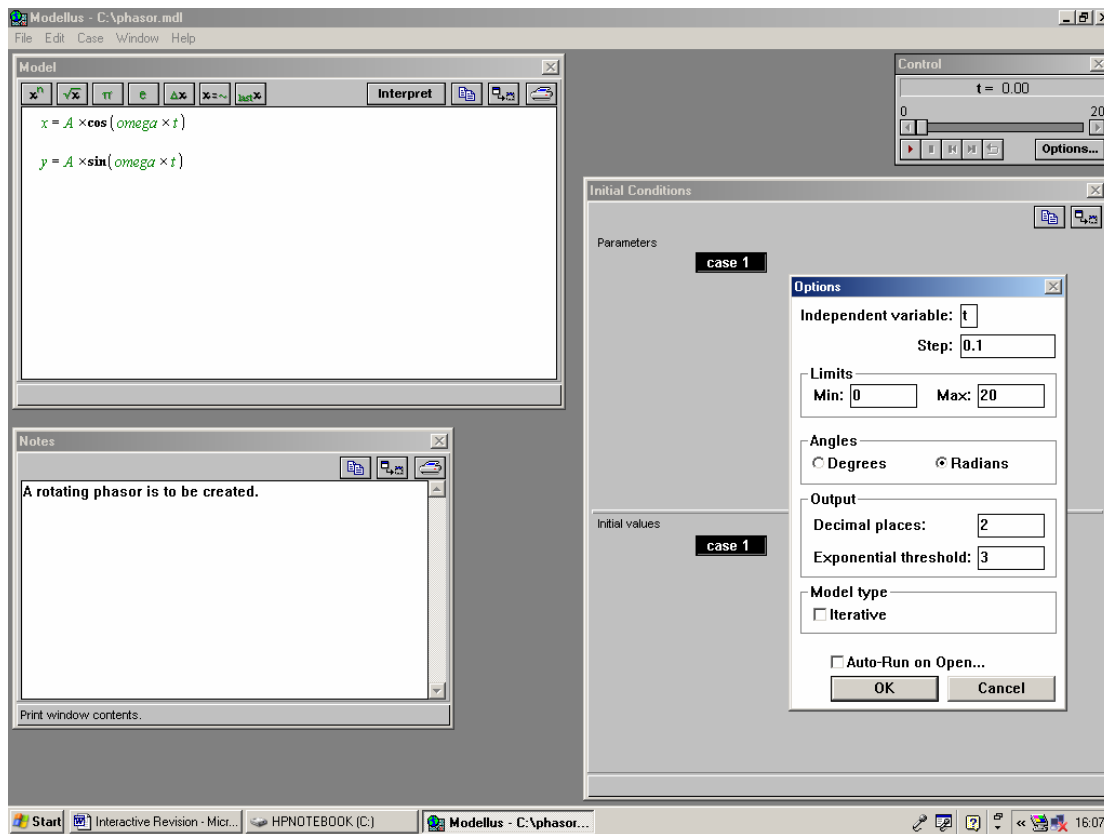


Step 1. Modellus Windows. I get the students to open Modellus and save the model. I have called this model phasor. The notes window is just a note pad, I encourage its use both for informing me what they are doing and of course others about how the model might be used.

The model window is where the equations are written.

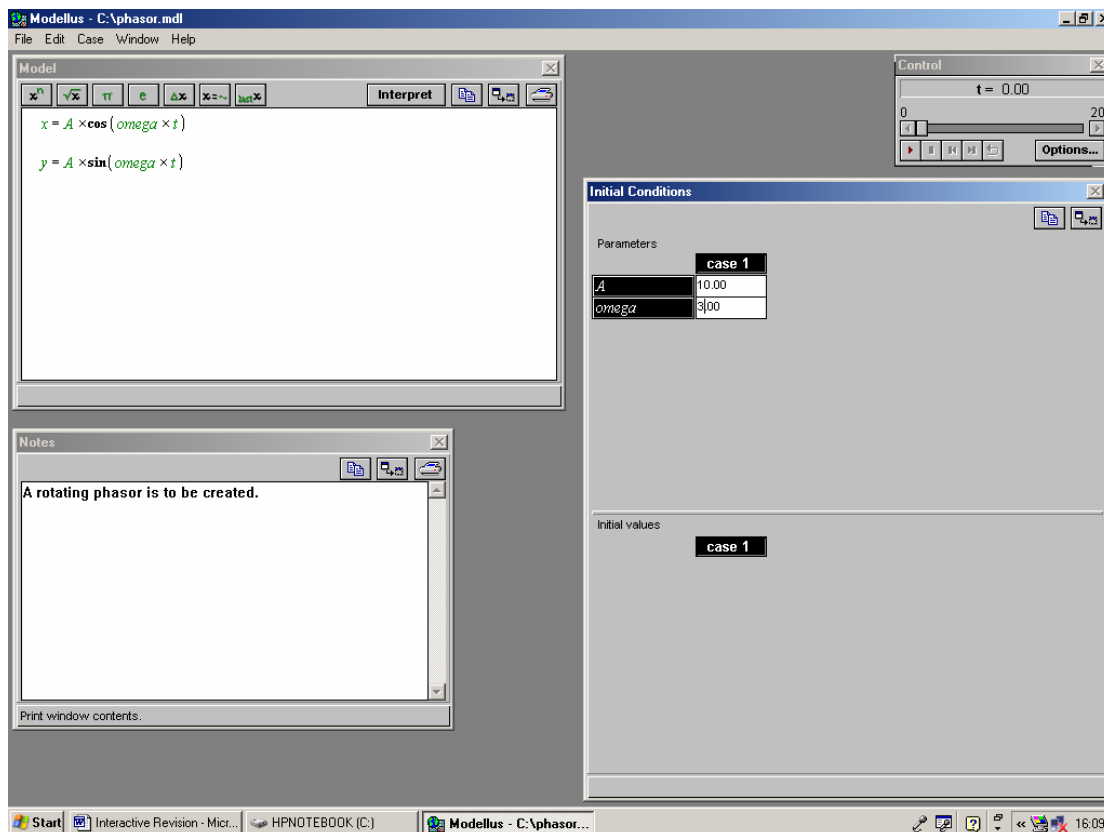
The control window allows animations to be controlled. Started, paused, stopped and reset. Other features of the calculation in the models can be set using the options button.

Once the model is interpreted, using the button, the initial conditions, parameters and values are identified by Modellus. Values have to be chosen. Different cases can be added, using the add case control.

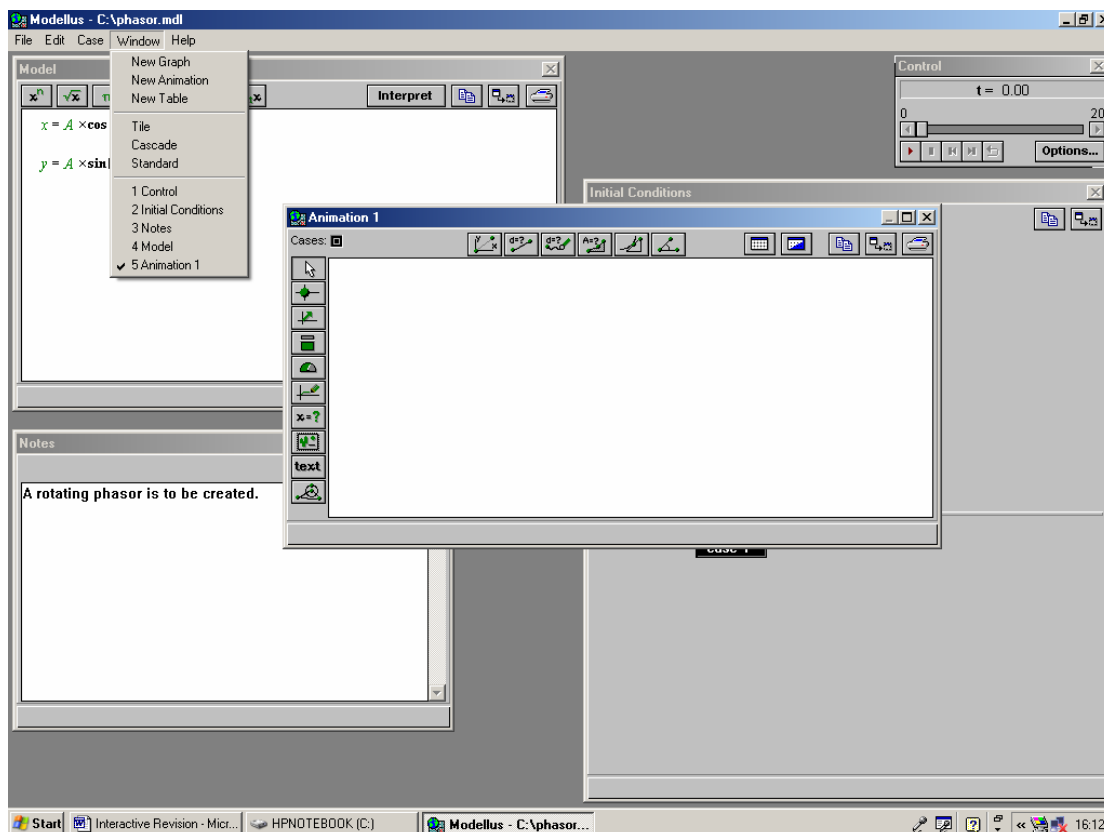


Step 2. A note has been added. Also shown above, model window, are the components of a vector, x and y . The exercise of writing these equations is preceded, sometimes, by a discussion of the maths on a white board.

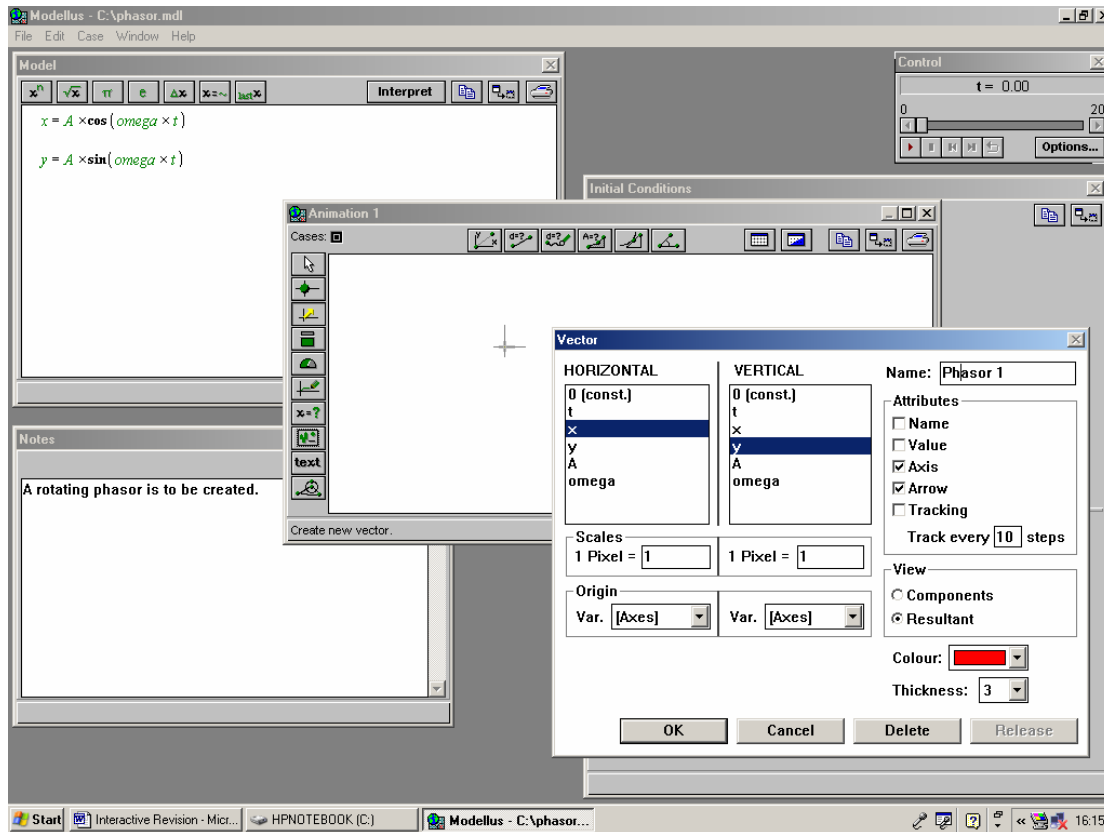
The options button has been used to set the angles to radians options.



Step 3. The model has been interpreted and the initial values chosen. Sometimes choosing the values is a matter of playing with the model using the animation screen.

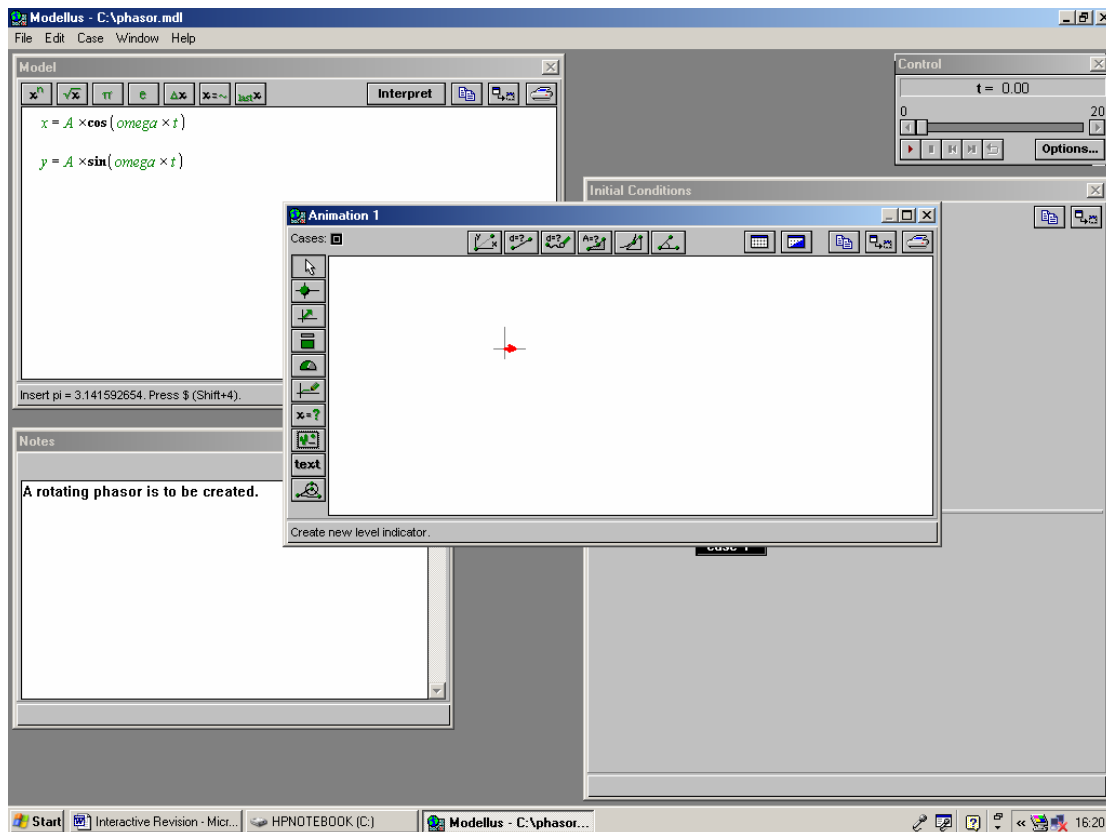


Step 4. Window -> new animation is selected and an animation screen appears. The power of Modellus is its ability to allow animations to be set up easily.

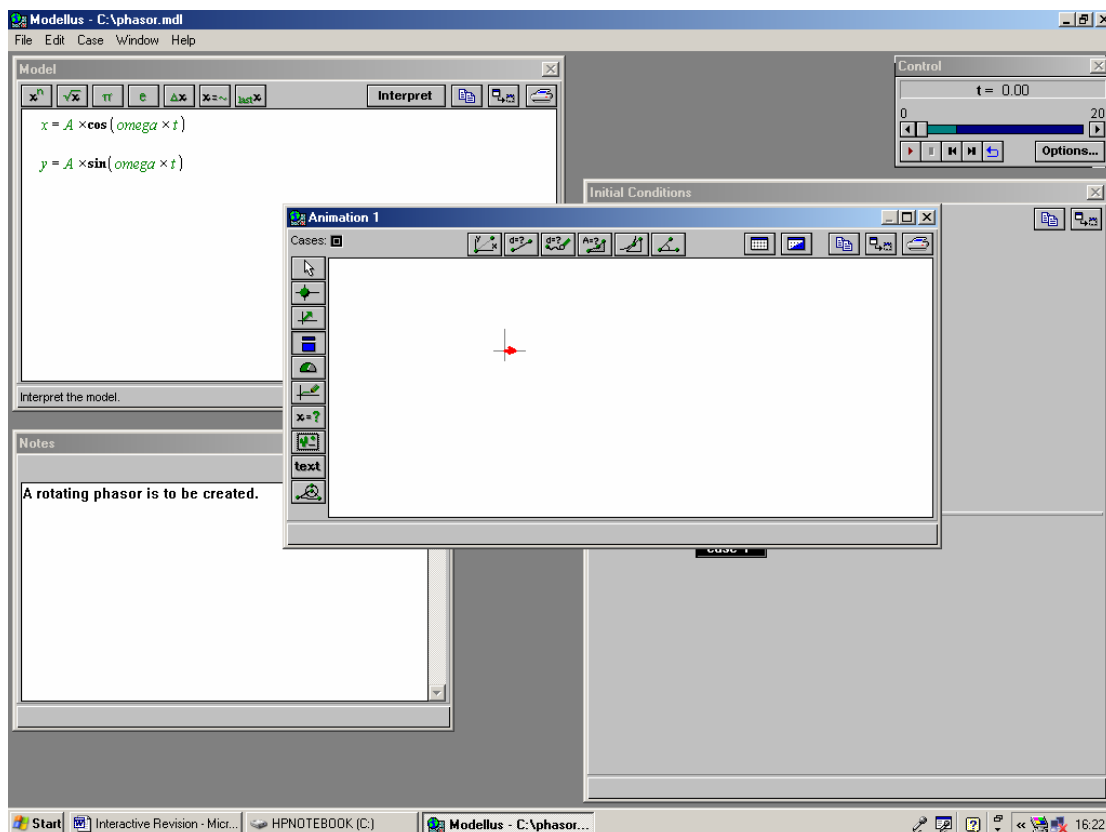


Step 5. A vector object is chosen in the animation window, yellow arrow on side tool bar in animation screen. The arrow is dragged out into the animation window, see axes on animation window.

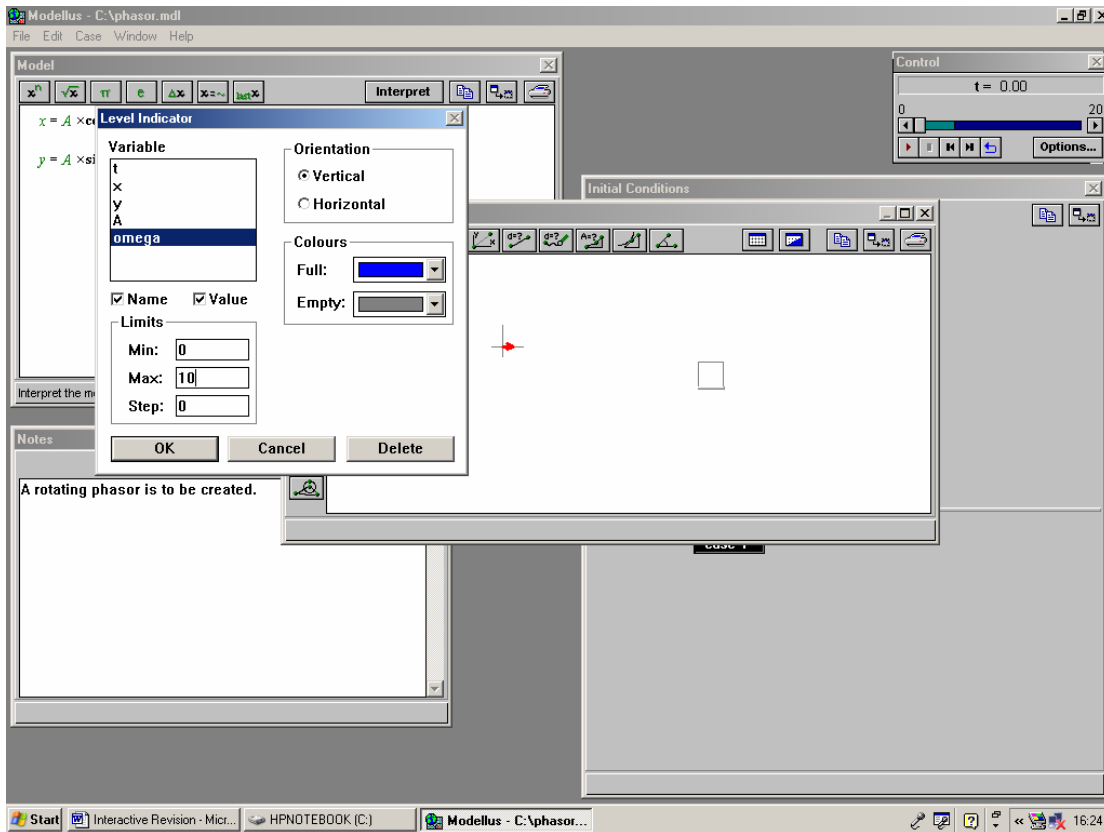
The vector properties window appears. The horizontal and vertical components have been selected as x and y. The colour and arrow width properties have been set as red and 3. Only axis and arrow are to be shown in the animation window. The vector is to be shown as resultant with a scale of 1 screen pixel to number 1 in model. OK is selected and you get the following.



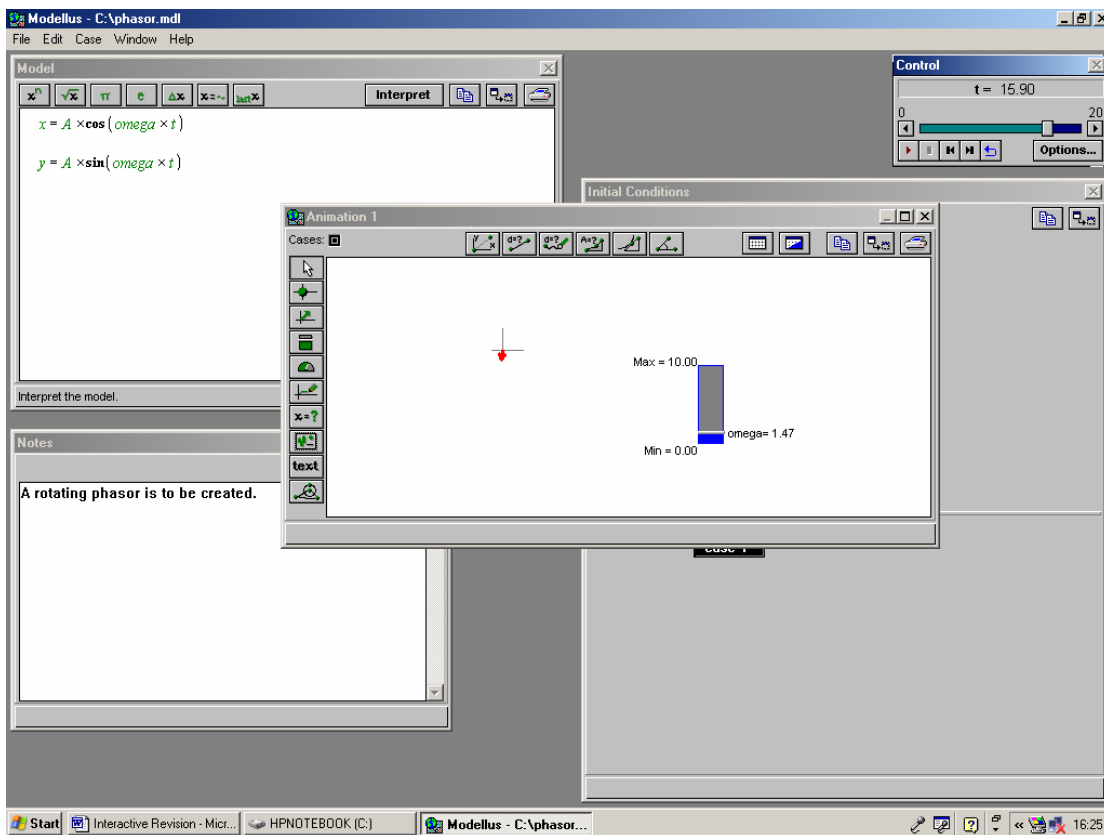
Step 6. Pressing the red arrow in the control window should get the arrow rotating anti-clockwise. The students have to go into the Initial values window and change the length and rate of rotation of the arrow.



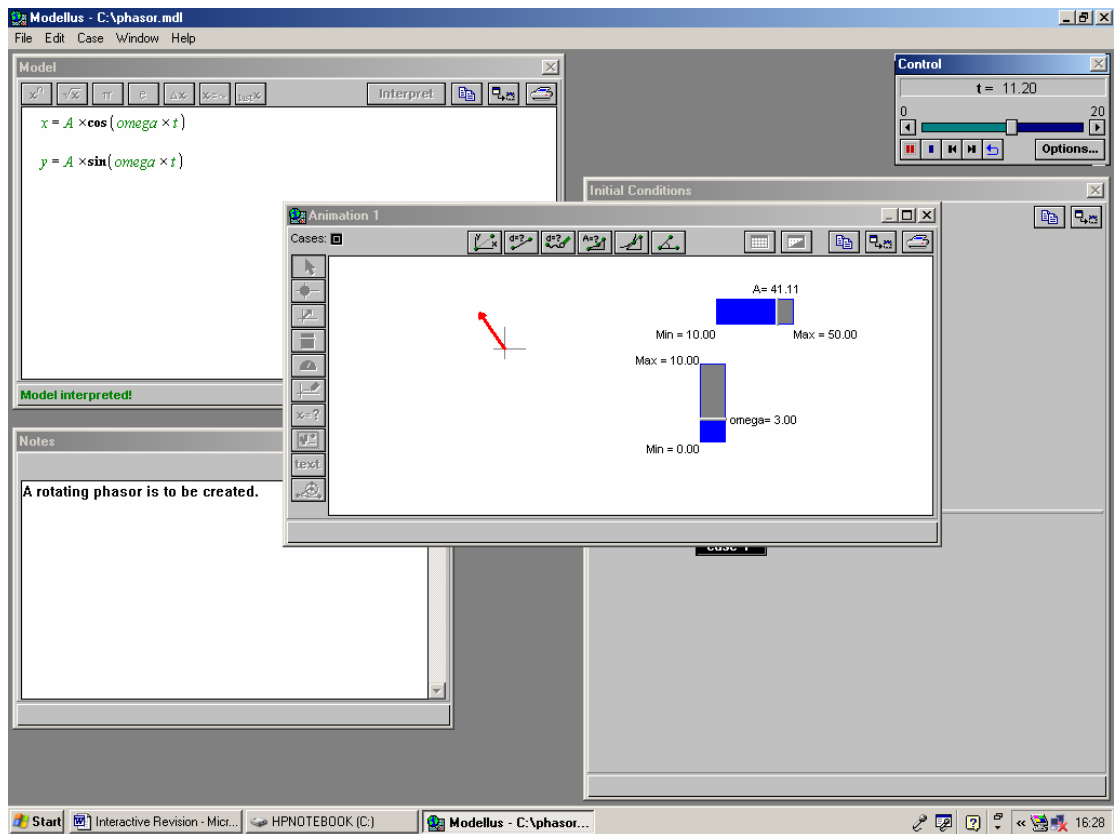
Step 7. A slide control is introduced fourth button down, blue, in the above picture. It is dragged out into the animation window.



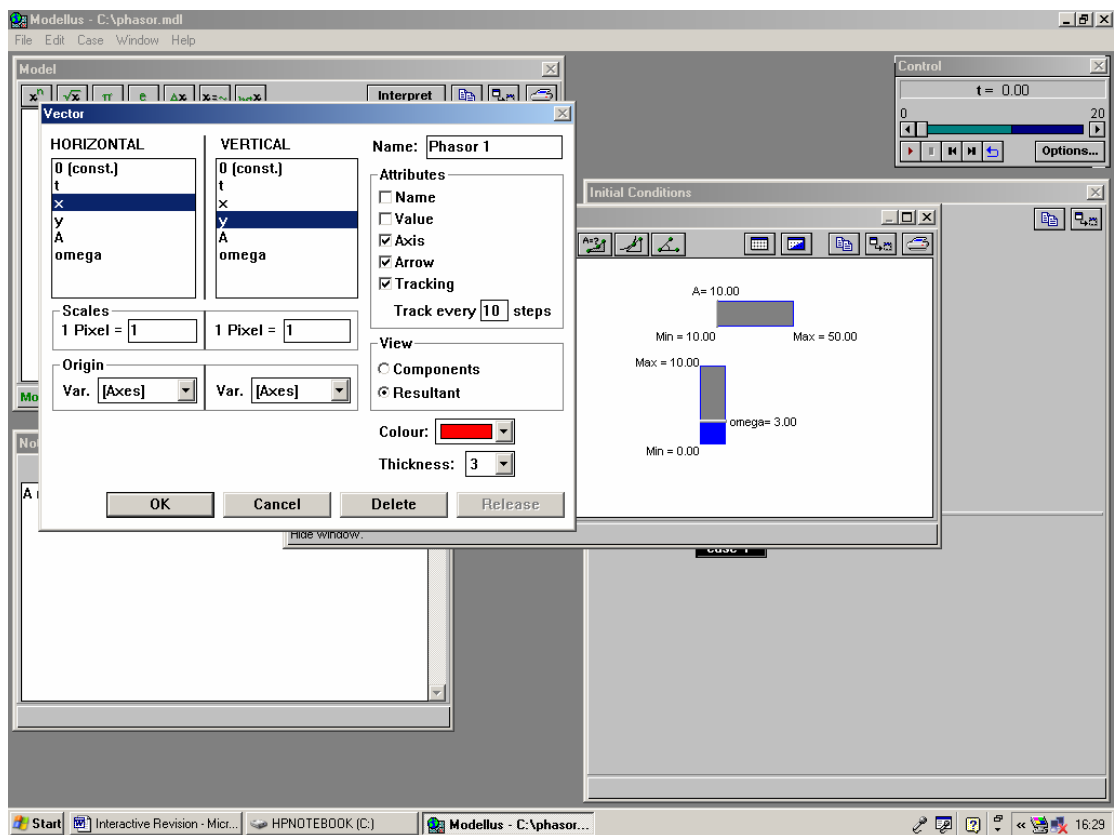
The properties of the slide control are chosen in the level indicator window. OK is selected and the model run again.



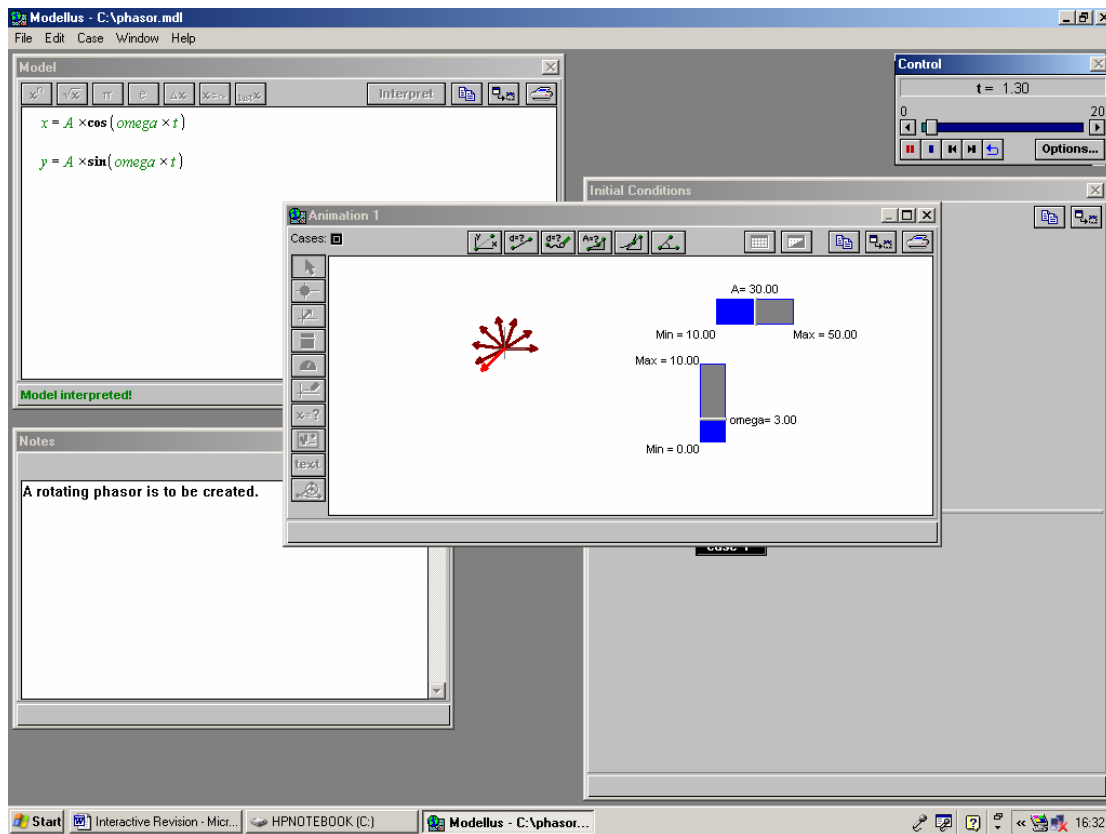
The slide control can be used to select omega. Students are invited to create a slide control for A.



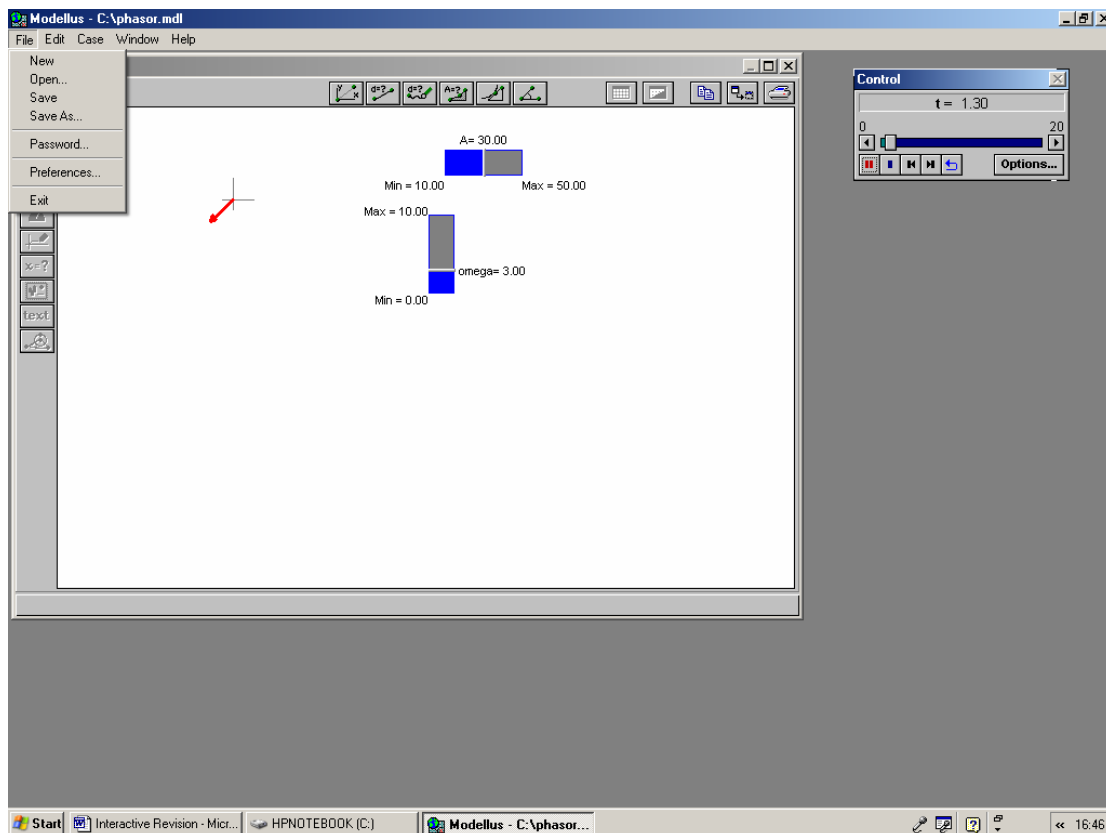
The figure above shows what a screen might look like now.

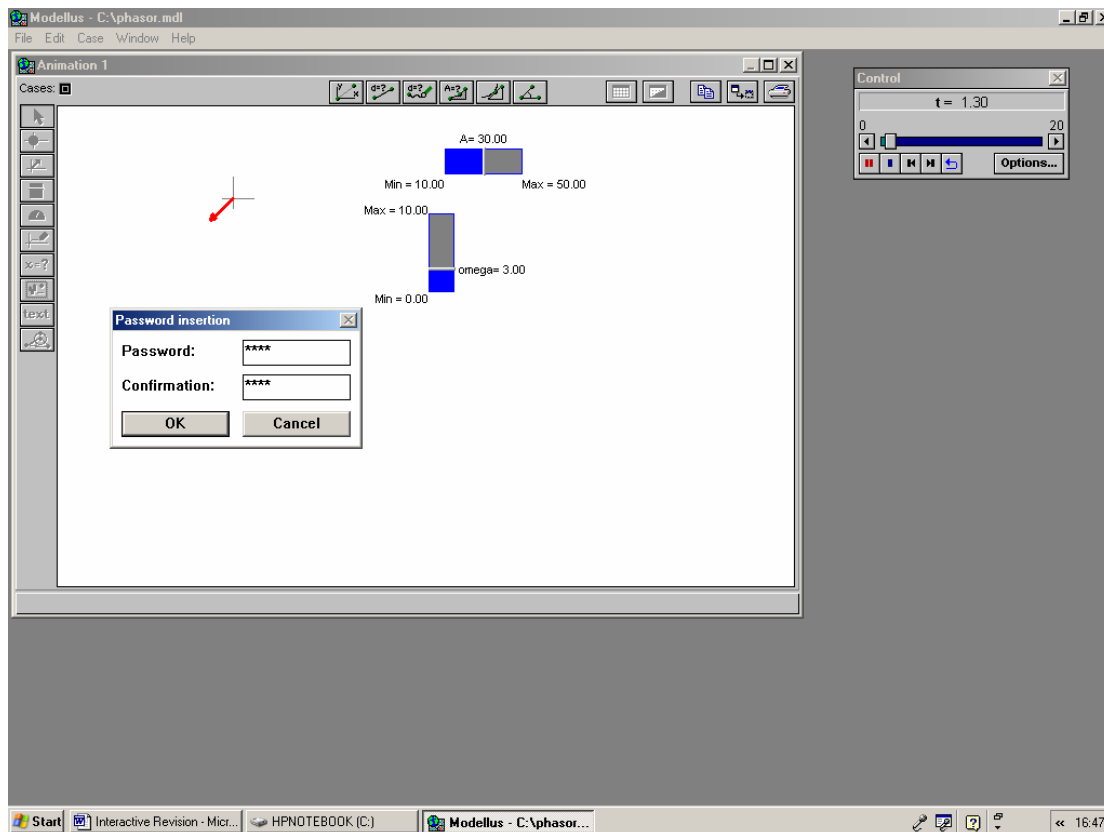


Step 8. A right button click on the vector object allows us to select the tracking option on the vector. OK is selected and the model run again.



The value A has been set to 30 and the tracking control set to track every two steps to produce this picture.





Step 9. OPTIONAL Password protection. We are selecting a password after hiding all the windows except the animation and control windows.

- This allows a teacher to control which windows are seen by students.
- The password-protected version of the model should be saved and that made available if this option is chosen. Students cannot edit the model in anyway after this is done.

This is the end of the lesson.

HOMEWORK

1. Students have to create another phasor whose properties they can control separately.
2. Then they have to create a vector object that gives the resultant of adding the two phasors, 1 and 2 together.
3. I may get them to introduce an independent initial phase angle into the 2 phasors they have created depending on the inclination of the group.

At this stage *all* the students are starting to see the structure in the models for chapters 6 and 7. *Some* are encouraged to explore further, creating their own animations and I start to learn a lot from them! **I never insist that creating models is part of the course but for some it becomes something they like to do and I encourage that.**