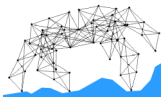
Sodarace – let's play!

sodarace
www.sodarace.net



Sodaconstructor is a sort of point and click, join the dots and add physics kind of software that lets you create…well almost anything! All the sodacreatures in the world are made of just three different bits, springs, muscles and masses. It's how you put them together that counts. So here is a quick guide to what things mean.

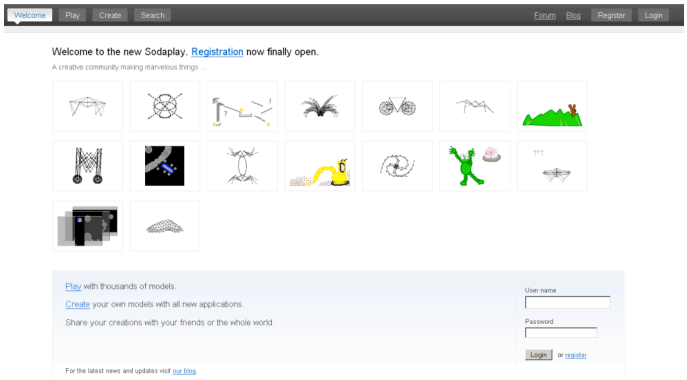
Masses	***Masses*** are the dots you draw and they can be movable or fixed. Fixed means they are 'nailed' to the screen and wont shift. Most masses move when they are pushed by muscles or pulled by springs.
Springs	***Springs*** are the lines joining the dots (masses). They are just springy, but they can be converted into muscles
Muscles	***Muscles*** are springs that expand and contract in time with the energy wave that powers the soda world (see below).
Muscle Amplitude	The amount by which muscles expand and contract is called their ***amplitude***. Small amplitude = small expansion and contraction, bigger amplitude = bigger movements.
Muscle Rest Length	The muscles expand and contract around the muscle's ***rest length***. It is the natural length of the muscle when it's not being squeezed or stretched.
Muscle Phase	The ***phase*** of muscles refers to how they expand and contract in relation to each other. This phase is important in making creatures walk. You set the muscle phases by putting the muscle slider at the right point on the energy wave. You might want muscle A to be shortest when another muscle B is longest, so muscle slider A would be at a position which was half of a wave away from muscle B's slider. That's because the wave goes from a maximum to a minimum in a half of its wave length.
Energy Wave	The ***energy wave*** is the wave that makes the muscles move, and is shown at the bottom of the constructor screen. It's called a simple wave or the more technical term is '*sinusoidal*'. The height of this wave (called its amplitude) can be set by selecting the muscle tab at the bottom right of the screen. The speed of the energy wave, how fast it moves through the muscle sliders can also be set in the MUSCLES panel.

At the bottom right of the screen you can play with the physics of the sodaworld: gravity, friction and springiness. So what do they do?

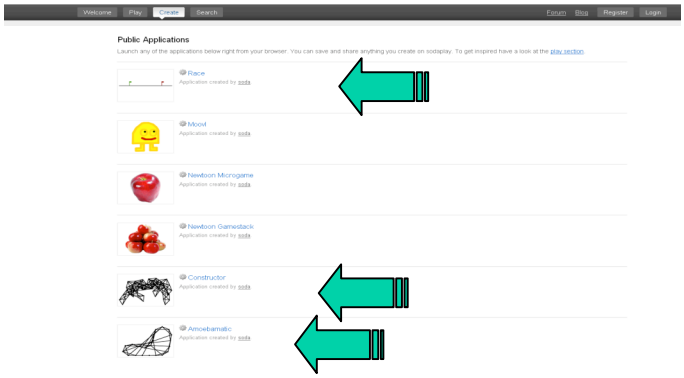
Physics: Gravity	This is fairly obvious. The more ***gravity*** the more the masses weigh, but here you can play with both the strength and direction of gravity. Use the slider to direct gravity upward and the masses will fall upwards, move the slider towards the bottom, gravity will reverse, and your masses will start to float down the screen. Turn it off and see what happens. The forces in constructor act on the masses via Newton's law.
Physics: Friction	***Friction*** is the force between surfaces. The friction slider determines how much friction there is in the system. Turn it to slippy and the friction is less, things slide about more, turn it to sticky and things will, well get sticky. There will be more friction.
Physics: Springiness	The ***springiness*** slider lets you set the stiffness of your springs. They can either all be loose (your creations will be quite floppy) or tight so the springs are fairly rigid. It actually fixes something called the spring constant, k. Hooke's law says that the force from a spring is k times by how far the spring is extended.

Let's get started using the new Constructor interface

Go to http://sodaplay.com/ then select the 'Create' tab at the top of the page



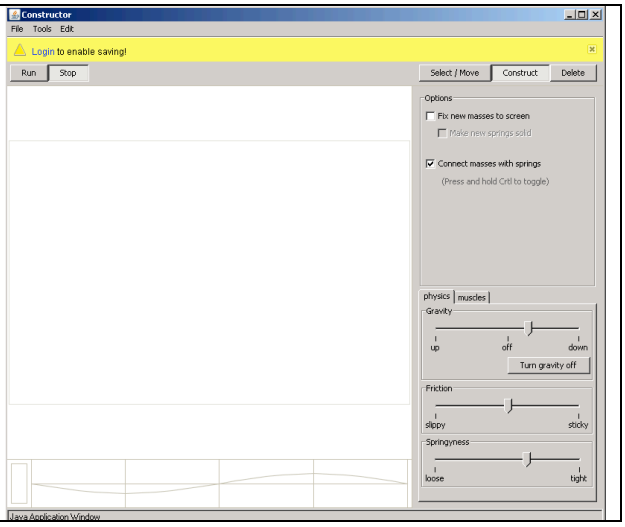
You will now see a list of applications to explore. Let's start with the constructor: the way you build your racers and creatures.



Starting the Constructor

Click on the constructor link (near the bottom of the page) or go directly to: http://sodaplay.com/creators/soda/items/constructor The link here will launch (start) the new constructor software. (Note you will need to have Java installed on your web browser for it to work). Click on the Launch button and the constructor software will download to your computer. It may take a little time depending on your connection speed.

You should now have a blank canvas like this on which to create.



Things to do when you have selected CONSTRUCT – drawing masses and springs

To start, make sure that you have selected CONSTRUCT in the top right corner. You can now point and click with your mouse to your heart's content, drawing masses (just make sure they are not fixed masses, nailed to the screen, unless you want these). If you want to connect up shapes with springs move your mouse back up to the first mass you drew. When your mouse is over this a small circle will appear, that tells you if you click that the spring will attach to the mass. So click. Done.

How to stop drawing springs and masses
To stop, you need to move up to the top right again. As you move your mouse it will still be drawing a spring, but don't worry once you select the SELECT/MOVE tab the drawing will stop and you are ready to go to the next stage.

Things to do when you have selected DELETE
– getting rid of unwanted masses and springs
If you have made a mistake, drawn an extra spring or mass, you can select DELETE at the top right, and this will let you click those pesky wrong lines into oblivion. When you click on a line it goes red, click again and its gone, but it leaves its masses behind. You may want these. If not just click them and they are gone too.

Things to do when you have selected SELECT/MOVE
– tidy your drawing and starting things moving.
With SELECT/MOVE on you can now shift any of the masses around to make them neater (click on the mass you want to move - it will turn blue and you can shift it). You can also use this mode to put your creature back in the right place if its been jiggling around when you have been running it.
You can also use the SELECT/MOVE option to start adding some movement. Notice that as you put your mouse on the spring a small circle appears in the middle. This is used to turn the spring into a muscle that can move on its own. Click and the whole spring will turn blue. Now look to the bottom of the screen. A small blue line with a dot in the middle has appeared at the right hand side of the wavy line. It is a muscle slider.

Muscle Building
Use your mouse to drag and drop the slider along the screen to the centre of the wavy line. What you are doing is turning the blue selected spring into a muscle by setting the position on the wave when the muscle expands and contracts. When you simulate (run) your creature, the muscles move in time with the moving wave. Make sure you offset the dot on the slider line from the centre. The further it is from the middle position the greater the size (amplitude) of the muscle expansion and contraction when it moves.

Constructor: a first steps tutorial

1. Drawing the Triangle creature
Click CONSTRUCT top right hand side, and you are ready to draw. First we are going to draw a triangle. Click somewhere in the middle of the window. A circle (a mass) appears. Move the mouse and click lower down on the left of the screen and a line (a spring) is created connecting these two masses. Now move to the right and click again. A third mass appears, connected by a spring to the second mass. Now we need to connect the last part of the triangle up. Move your mouse back up to the first mass you drew. When your mouse is over this a small circle will appear. That tells you that if you click the spring will attach to the mass. So click. Done.

2. Making the Triangle creature move
Now to make our triangle creature move, remember first we need to be in SELECT/MOVE mode. Select the spring at the bottom of the triangle, turn it blue and then move your mouse down to the energy wave at the bottom. Move the muscle slider onto the wave. Place the slider at the centre of the wave, and make sure the dot on the slider is moved off centre: push it a bit to the top. Next select the spring on the left hand side to make the next muscle. Drag and drop this muscle slider on the side of the energy wave to a quarter of the way up the wave. That makes the new muscle expand at a different time in the cycle. Remember to offset the muscle slider dot up a bit. Repeat that with the final spring of the triangle, setting the slider in the top half of the wave this time.

3. Running with RUN
You are now ready to bring your Sodacreature to life. Click on the RUN button at the top of the screen. Your Sodacreature should start to jig around and hopefully move along the screen, if haphazardly. You can pick it up with your mouse and throw it around if you fancy. You can also change the settings like muscle sliders and positions as well as the physics – the gravity and so on – while the creature is 'live'.

4. Experimentation: getting to know your creature
Try experimenting with the other settings ... changing the position of the muscle sliders and offsets, click the MUSCLE options to change the speed or the size (amplitude) of the energy wave. Can you make the creature travel faster than your original? You might like to try putting two triangles back to back (click stop and then select CONSTRUCT to start drawing again). By setting muscles in different ways you make several different creatures that way. Experiment a bit.

5. Saving your creature
To save your creatures, you first need to register. This is online and free, and can be done via the file menu at the top of the constructor application. Once it's done you can save all you fabulous creations on the sodaplay site and come back to make them better or share them with your friends. There is code available to allow you to put links to your best creations onto other websites like Facebook. Once saved you can also enter them in races, using the sodarace application, where they can compete against other people's racers.

Constructor Tutorial 2

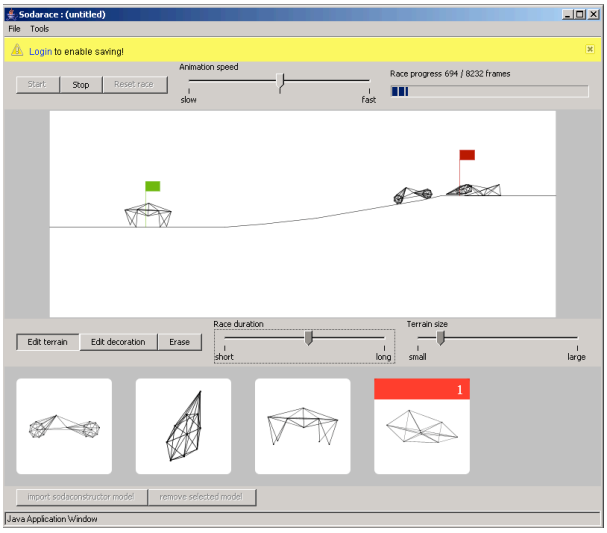
Building a better Triangle creature

1. In the FILE menu select NEW, a blank canvas.
2. Draw a triangle as with your first walking triangle, though make the sides roughly the same length. Remember you just click to make the masses, move the cursor and click again to make a spring, and then click SELECT/MOVE to finish and tidy up this first stage if needed. You are now going to go back and add the next elements.
3. Click CONSTRUCT again and from the top of the triangle, draw an upside down T into the middle of the triangle and out to the other corners.
4. Turn one of the bottom branches of the upside down T into a muscle. Remember you do that by clicking on the line (spring), then dragging the muscle slider onto the wave. Place it on the energy wave, a quarter way up. You want it to get a big pulse of energy so place the slider dot to the top as far as it will go at that point. That is where the energy is highest.
5. Now turn the other branch of the T to a muscle. This time connect it to three-quarters of the way along the energy wave. That way it will pulse exactly out of time to the other one. Give it lots of energy too by setting the slider dot up to the top of the wave at that position.
6. It is useful at this point to switch to simulate so that you can see what is happening. Click on RUN.
7. See how gravity takes hold and the creature drops to the ground. It then sways from side to side (like a Triffid looking for prey). That is because the two muscles are working together – when one expands, the other contracts in time to it. This will give the creature sideways motion, but to actually start to

lurch along it needs to be able to pick its feet up enough to overcome friction. We can do that using the central spring...

8. Turn the central spring of the T into a muscle. You need to catch it first –click on it as it sways past. Connect it to the centre of the energy wave. That means it will pull the middle of the triangle up just as the other two are partway through their cycle. That means it will pick its feet up just at the right point.
9. You should see it start to limp across the screen straight away if you are still in RUN mode.
10. Select STOP, then register and save your creature (using the MENU button at the top of the screen).

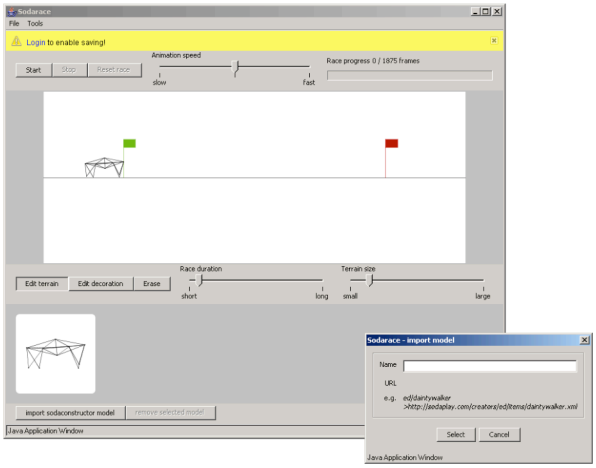
Sodarace: racing your creatures



The Sodarace application, which you can find on the sodaplay.com website, allows you to put your creatures into races with other people's. To do this your creature needs to be saved on the sodaplay site.

1. Launch (start) the sodarace application from http://sodaplay.com/creators/soda/items/race/
2. Again give the software time to download. You will now see the sodarace interface.
3. You can play around with the terrain (ground) and the race course. Select EDIT TERRAIN, click your mouse at some point on the racetrack, then click slightly further along, you can now move that section either up or down and do this for lots of different parts of the track.
4. EDIT DECORATION allows you to draw with your mouse on the racetrack to add whatever you fancy. The racers will just walk through this decoration though. All that's solid for them is the terrain under their feet.
5. ERASE will allow you to delete changes you made. That could be decorations you added or changes you made to the terrain. They turn red, and then you delete them.
6. If you press RUN, Daintywalker (sodarace's mascot), who is in there at the start, will begin to walk the racetrack.
7. STOP stops the race and you can increase the speed of the animation using the slider at the top of the screen and watch how long the race is taking.

8. TERRAIN SIZE lets you scale the racers to the racetrack and experiment. See how, as you increase the racetrack size, Daintywalker gets smaller. It's like zooming out with a camera to watch a marathon.
9. RESET RACE puts all the racers back to the starting line.
10. When the winner passes the finish line their position in the race is shown on their picture at the bottom.
11. You can add and remove racers from your race using the buttons at the bottom.
12. To REMOVE a racer click on its picture and press REMOVE SELECTED MODEL.
13. To ADD a new racer click on IMPORT SODACONSTRUCTOR MODEL. This will open a new box which allows you to put in any saved constructor model. They can either be your own or those created by others.



14. To ADD a model in you need to copy and paste the name of the location where it is stored on the sodaplay site into the box. If you go to http://sodaplay.com/play/ you will be able to see all the constructor models others have created. To add one of these click on it, and look for the line that says **Permanent url for this item:** it will be something like http://sodaplay.com/creators/person123/items/racer1. This means it was saved by a someone who has the username person123, and their model is called racer1.
15. Copy and paste http://sodaplay.com/creators/person123/items/racer1 into the box and person123's racer1 will be on your starting line. It's the same if you want to load your own racers too. Just use the correct '**Permanent url for this item'** address.
16. If you're registered and logged in (see the FILE menu at the top of the screen) you can also save your races onto the sodaplay site.

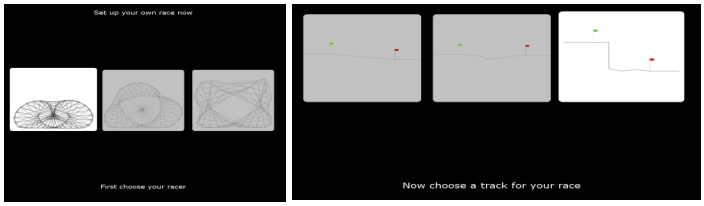
Reinventing the wheel with Amoebamatic

There is another application called Amoebamatic. This is a tool for automatically generating a variety of rolling Constructor models known informally as "Amoebas".

1. Launch it at http://sodaplay.com/creators/soda/items/amoebamatic/
2. You now have a load of things to experiment with: how to connect the springs and muscles, the muscle phase (how much they move) and amplitude (how they move in relation to each other).
3. It's a useful mental gym to get used to how the various parts of soda creatures combine together to form different types of movements.
4. Try playing with the physics too, how does this change things?
5. You can get a feel about how fast your amoeba will be by looking at the 'ground' under it.
6. Once you've made it move like you want you can save it and then add it to your races.

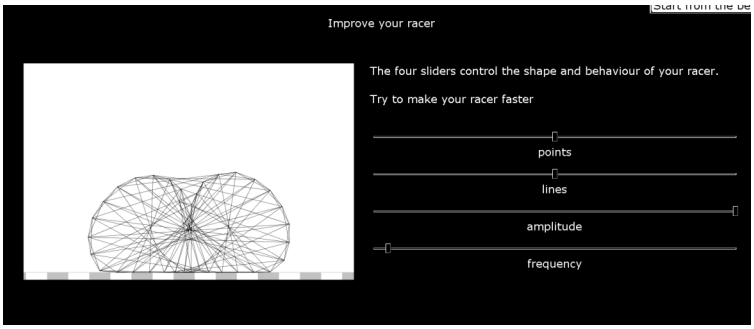
Playing with a little bit of artificial intelligence

If you want to explore the fascinating world of artificial intelligence you can. Go to www.sodarace.net and download the kiosk software. This was used in the 2007 UK sodarace tour that went all over the UK. It's really easy to use: its point and click all the way.

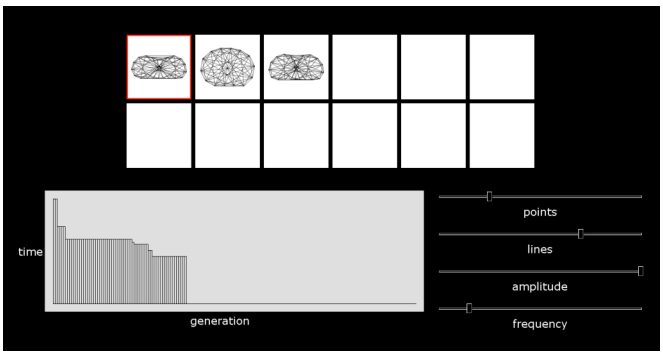


1. First choose your amoeba from the three available.
2. Next choose your favourite racetrack terrain.
3. You'll then see the race with your amoeba (with the red triangle above) head to head with some of sodarace's finest. Then press START RACING
4. After the race you will see where you were placed on the winners podium. You now have two options.

5. Try and improve your amoeba by HAND. This lets you use the same tricks you learned from Amoebamatic, changing muscle phase amplitude and so on. Now race again. Did you do any better?



6. Alternatively, let the computer take the strain by pressing the AUTOMATICALLY button after a race. The computer will then try to use some simple artificial intelligence to make a better amoeba. Just like you it will work by trial and error. It will make a change then race that amoeba, and see if the change made things better. If the change has improved the racer, the computer keeps the change. If the change doesn't then the computer throws that amoeba design away.



7. Like biological evolution it's survival of the fittest: in this case the fittest amoeba is the one with the fastest race time.
8. What you will be able to see is, at the top of the screen all the various attempts the computer has made to do things better (the red square is the best found so far). Underneath you can see the time taken for the race to be run. Hopefully, if the computer evolution manages to find a good set of changes, you should see that graph drop as the generations of possible amoeba pass by, hopefully getting faster as time passes.
9. You can have a look and see how it is doing by pressing race again. You can even help the artificial intelligence out a bit (or hinder it) by doing some changes by hand, then seeing where the AI takes it from there.
10. Try different racetracks and see what solutions the AI comes up with to get the fastest time. Like biological evolution, digital evolution can come up with some strange solutions!

Advanced construction tips

1. When you select a muscle you can set its rest length exactly using the numbers displayed on the right hand panel under MOVE/SELECT. This will let you fine-tune your creations.
2. When you select a mass you can set its position exactly using the numbers X and Y coordinate numbers displayed on the right hand panel under MOVE/SELECT. This will also let you fine-tune your creations. (X= horizontal position, Y= vertical position. The active area is around 400 pixels high by 600 pixels wide with the origin at the bottom left corner.)
3. Hold down the SHIFT key as you select muscles and springs in the MOVE/SELECT mode. They will turn blue and you can copy and paste them using the EDIT menu at the top of the screen.
4. The EDIT menu also allows you to do a 'select all' so you can create creatures using repeated 'building blocks' like triangles and so on.
5. If you want to get hardcore then you can use the TOOLS button at the top of the screen in all the applications to look at and edit the XML file. It is a computer file that contains all the information about your creature. It's a list of commands that the computer uses to place the masses springs and muscles, and it's this file that's actually saved when you save your creations. If you are brave or interested you can edit this file directly and see how it changes what's displayed on the screen. XML, short for '*extensible markup language'*, is a standard Computer Science way to store data in a way that allows lots of different applications to use the data. Rather than just giving a long list of numbers, these numbers are annotated (marked up) in the file, explaining exactly what they mean. This makes portability much easier.

Department of Computer Science
Queen Mary, University of London

Also see www.cs4fn.org for more Sodarace stuff and other interesting things like games, free magazines and ringtones as well as magic tricks.