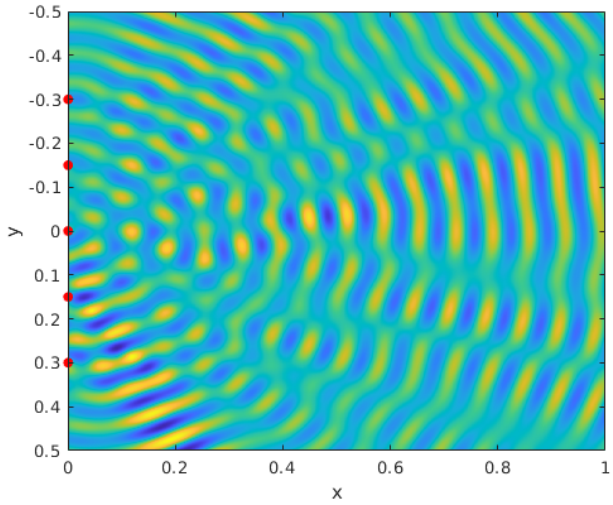
For homework 8 you need to submit at least 4 figures.

1) The first figure is an image of 5 radial point sources. These can be created by adding 5 of the images created by the code Dr. Parra showed in class. It could look something like this:

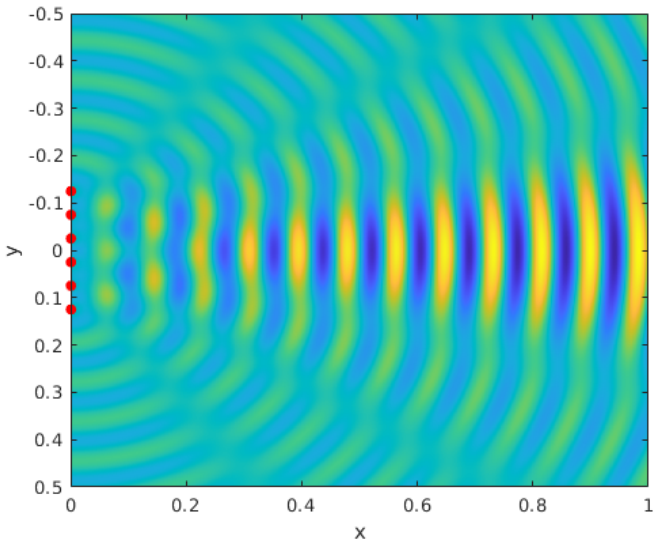


It's best to implement this in a loop so that there are 3 variables you can play around with:

- The number of sources
- The distance between the sources
- The spatial frequency

It helps to plot the locations of your sources with some markers so you can better image what's going on.

2) One you have this code you can create the second image. You need to adjust the parameters above to create a beam:



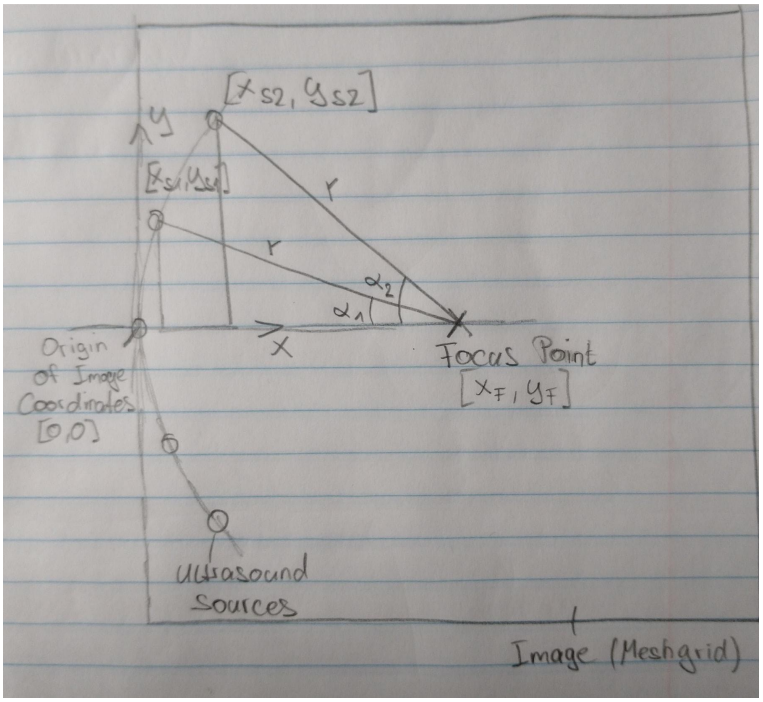
Many combinations of the parameters can achieve this.

3) For image 3 you need to focus the wave on a single point.

This can be done in two ways:

- Arrange the sources on a circular segment. The focus will be at the center of this segment.
- Arrange the sources on a line and add a phase delay to the sources increasing from the one in the middle. The wavefronts have to form a circular segment as well.

You need to think about the geometry to calculate the exact location of the sources or phase delays:



To calculate the locations of the sources on the circular segment you need to choose:

- The coordinates (x,y) of the focus point
- The radius of the circular segment
- The number of points
- The angle between each point on the segment (defines the distance between them)
- The spatial frequency

Then using trigonometry you can compute the x and y positions of the sources.

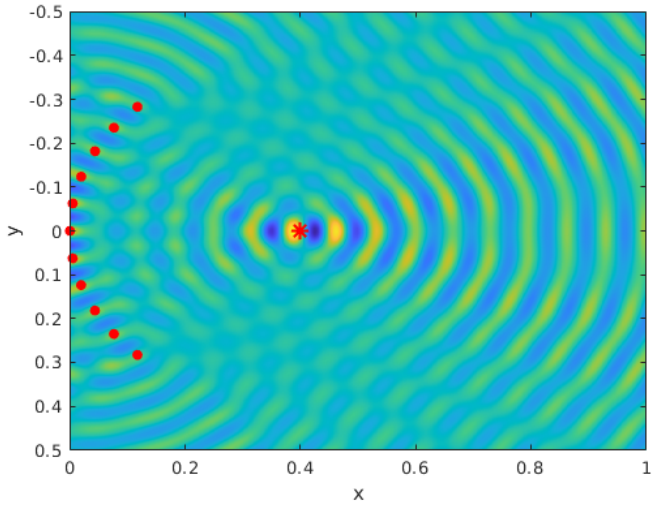
If you arrange the sources on a line and want to compute the phase delay, you need to choose:

- The coordinates (x,y) of the focus point
- The radius of the circular segment
- The number of points
- The distance between the points along the y axis
- The spatial frequency

Then you compute

- The delay in spatial units (mm, pixels) for each source
- The phase delay based on the spatial frequency of the wave

The figure would look similar to this one:



4) In the last figure, you need to change the angle of the beam in figure 2. You again need to think about the geometry, sketched out in slide 12.

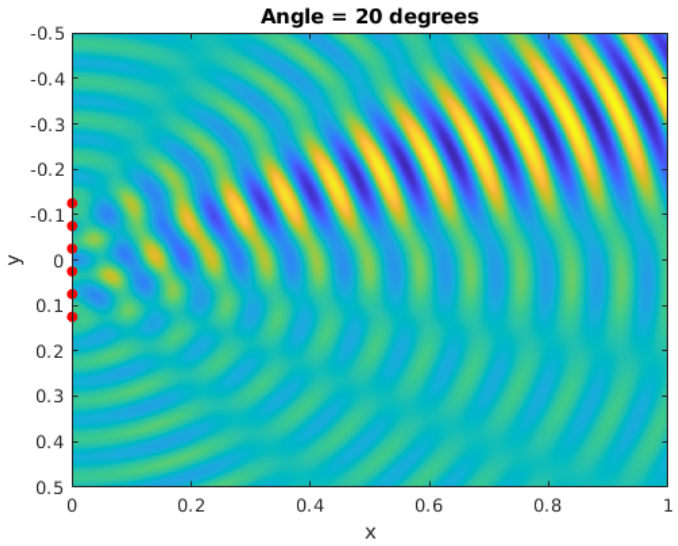
You can keep the following the same as figure 2:

- The number of sources
- The distance between the sources
- The spatial frequency

But now you also need to choose an angle to stir the beam.

Then you can compute the delay Δ (figure on slide 12). It depends on the angle and the distance between the sources. Since this is in spatial units, you then convert it into a phase delay, taking into account the spatial frequency of your wave.

It could look something like this:


Angle = 20 degrees
-0.5
-0.4
-0.3
-0.2
-0.1
0
0.1
0.2
0.3
0.4
0.5
y
0
0.2
0.4
0.6
0.8
1
x