First, I want to know what edge detection you use.

I used this operation:

-1 -1 -1
-1 8 -1
-1 -1 -1

So basically every pixel value is multiplied by 8 and then you subtract the adjacent pixels. This only works if your image is in black and white. There are more complicated kernels but I did not use them in this assignment.

Second, in edge detection, i want to change the exact calculation process into a approximate calculation process, but i do not know where to touch it.

This edge detection is far from exact. It really only works with very well defined edges like the circle image I used. If you wanted to change the calculation you would need to change the edge_detect.v file and make a different matrix operation. These can be found online. Keep in mind that for more advanced edge detection you need to pass more values to the module and that requires some changes in the test bench as well.

Finally, if i adjust the size of the file, what should i do?

Step 1:

I apologize but part of this is my fault. I did not change all the values in the file to WIDTH. In some places I hardcoded 768. You would have to go through the document and change those values. For example if you see 769 change it to WIDTH - 1.

Step 2:
The hex files I provided would no longer work. You would have to find an image you want to use (preferably black and white) and convert it to a bmp file of the size you want. You can convert images to bmp from other formats online. After you have the file in the correct size I used this Matlab code to convert the bmp file to a text file of the pixels' hex values:

```
b=imread('C:\path\Circle.bmp'); % 24-bit BMP
image RGB888
k=1;
for i=512:-1:1
for j=1:768
a(k)=b(i,j,1);
a(k+1)=b(i,j,2);
a(k+2)=b(i,j,3);
k=k+3;
end
end
fid = fopen('C:\path\Circle.hex', 'w+');
```

```
fprintf(fid, '%x\n', a);
disp('Text file write done');disp(' ');
fclose(fid);
```

Obviously change 512 and 768 to what you need.

Step 3:
You would also need to change the header values in the test bench. We are outputting to a bmp file. The first values in a bmp file describe the file itself (for example the number of pixels wide and tall). This header can be found online also and all you would need is to hard code those changes in the test bench header part.

I know it is a lot. I would definitely recommend at least trying to get it to work with the files I provided and then making changes to the code.