

 Bournemouth University Faculty of Media and Communication	Time Constrained Paper Brief		2023/24
	Computer Animation Technical Arts		L5
	Advanced Maths for Computer Graphics		
	This assessment is a formal element of coursework worth 100% of the overall unit mark (Each piece of coursework may vary according to the unit)		

GENERAL INSTRUCTIONS TO CANDIDATES

- The time constrained paper will be released at **12:00 on 20th January 2025** and should be submitted by **12:00 on 24th January 2025**.
- The time allowed for the paper should cover any eventualities relating to ALS, students residing overseas and slow connectivity to the internet.
- If during the period of the time constrained paper you experience any technical issues you should contact BU IT services on 01202 965515 and report the issue immediately - if you are affected by an IT issue you will need to provide evidence of this.
- All records of time mentioned here are based on current UK time.
- **Please read the instructions carefully and ensure you understand how many questions you need to answer.**
- The usual BU academic offences structure remains in place and in force and this time constrained paper is now similar in structure to a typical individual assignment.
- You should use BU Harvard referencing if citing other people's work (including any use of AI).

SPECIFIC INSTRUCTIONS FOR THIS ASSESSMENT

The assignment consists of steps which you should complete in order. Verify each is working before moving on to the next. For each stage of the assignment, you should include results in a report, demonstrating that you have implemented the required features, and write 100-300 words explaining your work. You should also submit your final image and a single copy of the complete program which implements all the steps.

You may use any programming language or libraries to support your work but you are expected to implement the core functionality in your own code. Any code which you did not write yourself should be clearly labelled, as per the NCCA Coding Standard.

SUBMISSION DETAILS

The paper is to be electronically submitted via the Assignment Submission area in Brightspace by 12 noon on the 24th January 2025. Please allow sufficient time to upload files before the deadline.

You should submit:

A report in PDF format.

The source code as a plain text file.

The final image in a standard image format.

You must keep a copy of your work – the university will not take responsibility for lost submissions.

ASSESSMENT TASK

- a) Write code to load in an image of your choice, display it on screen and save it back to disk [5 Marks]
- b) Write code to Fourier Transform each row of image. Show the result, and Fourier transform it back to the original image. [20 Marks]
- c) Switch the rows and columns of the Fourier transform results, then Fourier transform the new rows to produce a full 2D Fourier transform. [15 Marks]
- d) Create a second image containing a box convolution kernel. Transform both images, multiply them together and transform back [20 Marks]
- e) Choose a “better” convolution kernel and apply that to your original image to produce an aesthetically pleasing blur [10 Marks]

Additional Marking Criteria:

- a) Documentation [10 Marks]
- b) Code Clarity [10 Marks]
- c) Quality of Final Image [10 Marks]

Notes:

You may implement a regular Fourier Transform or a Fast Fourier Transform. The fast version is harder to implement and not required. The simpler version may take a few seconds to handle a moderately sized image but correct operation is more important than performance.

Remember that although your source images are real, the inputs and outputs of the Fourier transform are complex.

If you choose to use a FFT image then your source images will need to have a resolution which is a power of 2. (eg 512x512)

You can treat the Fourier transform as a self-inverse, so only need to write one Fourier transform function. However, you will need to account for the $1/N$ scale factor and the resulting image will be rotated.

A 2D Fourier transform is produced by Fourier transforming each row, and then each column of the image. This is most easily done by transforming the rows of the image, reflecting the intermediate result, and transforming the rows again. Once transformed, high frequencies will be in the middle of the image, furthest from the corners.

Your convolution kernel should be based in the corners of the image, centred at 0,0. Remember the image wraps so neighbouring pixels would be (0,1) (1,1) (1,0) (511,1) (511,0) (511,511) (0,511) (1,511). Simply. Setting these pixels to 255 would be an appropriate starting point for your filter.

- **Plagiarism and Self-Plagiarism:** You must acknowledge your source every time you refer to others' work or work that you have previously submitted and been assessed on, using the **Harvard Referencing** system (Author/Date method). Failure to do so amounts to plagiarism or self-plagiarism which is against University regulations.

Please refer to <http://libguides.bournemouth.ac.uk/study-skills-referencing-plagiarism> for further details of this and to <https://www1.bournemouth.ac.uk/discover/library/using-library/how-guides/how-cite-references> for the University's guide to citation in the Harvard style.

Students must ensure that they do not commit any type of Academic Offence. For further information please see: <https://www1.bournemouth.ac.uk/discover/library/using-library/how-guides/how-avoid-academic-offences>

- Plagiarism regulations extend to audio visual materials and work in other media. Archive or other material not generated by yourself or crew must be appropriately captioned when on screen and an acknowledgement to the source of the material included in the end credits or equivalent part of any online material. Failure to do so amounts to plagiarism or self-plagiarism, which is against University regulations.
- **Bespoke 1-1 academic guidance and support** for FMC students is provided by a specialist team of lecturers within the faculty. To book a one-to-one appointment please email: FMClearningDevelopment@bournemouth.ac.uk
- Students with **Additional Learning Needs** may contact Learning Support on <http://studentportal.bournemouth.ac.uk/learning/als/index.html>
- General **academic support** is available via the Study Skills community on Brightspace.
- If you are unable to submit on time due to medical or other circumstances you **MUST** obtain an approved postponement **PRIOR** to the submission deadline. Extension/Postponement Request Forms are available from the university website under Student Policies, Regulations and Procedures / Assessment then Extenuating Circumstances

<https://www1.bournemouth.ac.uk/students/help-advice/looking-support/exceptional-circumstances>

Please make sure you read these documents carefully before submitting anything for consideration.

- Please be mindful that certain actions carry risk which should be adequately assessed before undertaking the activity. Please refer to University/Faculty guidance for clarification.

Disclaimer: The information provided in this brief is correct at time of publication. In the unlikely event that any changes are deemed necessary, they will be communicated clearly via e-mail and via the VLE and a new version of this brief will be circulated.

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