Examiners' commentary 2018–2019

CO1112 Creative computing I: image, sound and motion – Zone A

General remarks

Overall, performance on this paper was good, with the average mark being a high second class. Nearly a third of the cohort obtained a mark in the first class range, with a couple of these being excellent marks. Only a very small number of candidates failed the paper, but these fails were extremely weak, and these candidates performed extremely poorly on all questions they attempted.

What follows is a brief discussion of the individual questions on this paper, with hints and explanations of the answers expected by the examiners.

Comments on specific questions

Question 1: General

Only about a third of candidates chose this question, and performance on it was generally poor. Only one candidate performed well, obtaining most of the 25 available marks. The rest obtained 12 marks or less.

For part (a), answers that were expected might include any of the following: being able to do things – such as very fine work – that are physically difficult; being able to do colour work, sometimes more accurately – and here a limitation is that screen colour is different from print colour; patterns and recursive artefacts; mosaic portraits and such new visual techniques. It was important to include limitations in the discussion.

Part (b) answers included the use of computers to design clothes, to control knitting machines, and a valid and interesting response about wearable technology. Examiners welcomed sensible and wide-ranging answers that showed breadth and depth of understanding, provided they did actually address the question being asked.

Part (c)(i) was the one that most candidates were able to answer correctly, noting that it is a test for computer intelligence, using a human to decide whether the responses it gets are from a man or a woman. Some candidates mentioned that it was deciding between human or computer responses; this is not strictly correct in the original test from Turing, but has become accepted as a general description, so full marks were awarded for this. In response to part (c) (ii), some suggestions were that it could be used to decide whether a creative artefact was made by a human or by a computer, or thatit could be used as the basis of a measure of the level of creativity in any artefact.

Hardly any candidates showed an understanding of what synaesthesia is, and sothere was only one strong response for part (d). It is the linking of one sense to another in general. In neuro scientific studies synaesthesia is defined as the elicitation of perceptual experiences in the absence of the normal sensory stimulation; in the arts the concept of synaesthesia is more often defined as the simultaneous perception of two or more stimulias one Gestalt experience; however knowledge of this was not essential to obtain full marks. Kandinsky came up with theories of links between colour and sound, though

he believed that there was no scientific basis for this and the links were purely subjective.

Question 2: Data, sound and motion

This question was a relatively popular one, and performance on it was average, with one excellent answer that obtained almost full marks.

Part(a) was a straight forward question, which most candidates answered correctly. The class is the P Imageclass, which has an array ofpixels, with each pixel containing RGB and Alpha values. The other two integers are the height and width of the image.

Candidates generally answered part (b) well, though not all answers related to audio signal compression and simply discussed images. The considerations in general are similartoaudio,andincludethetrade-off between fidelity and storage space and that it is possible to perform lossless compression without any loss of fidelity. Good answers demonstrated understanding of the fidelity aspects of image, such as whether an image is being used for a large print or just for basic display.

Forpart(c)examiners accepted answers that were algebraic–that is,about the matrix manipulations – or visual – where they were described in terms of how objects or images are displayed. Answers that showed understanding that translation is about moving to else where in the vector space, while rotation is about turning within the space, or relative to the axes, were acceptable.

Many candidates correctly stated, for part (d), that matrix multiplication is commutative only if A and B are square matrices, diagonal, and of the same dimensions as each other, however it is not generally commutative. Some candidates commented that it is possible that $A * B$ might not even be possible to perform – and likewise $B * A$ – if the dimensions are not correct. Justifications could be algebraic, or by examples, or by graphical drawings.

A few candidates provided very good responses for part(e),whichwas clearly explained in the subject guide. Pitch and volume are controlled by moving the hands towards and away from the device, left and right hand respectively.

Question 3: Shape and structure

This was a very popular question chosen by most candidates, and with good average performance. Only a small handful performed particularly well, however, with the same amount also performing poorly. A very even distribution here.

For part (a), almost all candidates were able to answer that a fractal is a form that has self-similarity. Not all candidates provided a suitable example, unnecessarily losing the marks for this part.

For part (b)(i), most candidates could provide a good distinction between repetition and recursion. Recursion requires a 'calling of itself' for a method or procedure; repetition does not have this and is simply a redoing of the same thing with minor – or even no – changes.

For part (b)(ii), examiners accepted all good discussion that was correct and relevant. Some examples of artists include Warhol, Escher, Cage and Cunningham, andexaminers required discussion of the relevant repetitive or recursive aspects in their work.

Part (c) was generally very well answered, and most candidates also provided the required diagrams. Descriptions that were correct and conveyed understanding were accepted and did not need to be exactly as in the subject guide. In general, examiners are looking for demonstration of understanding, rather than simply being able to recollect verbatim what appears in the study materials.

Question 4: Motion and 2D graphics

This question was answered by almost all candidates, with generally reasonable answers.

For part (a), the diagram should have shown the size of screen (800 x 800); background colour (0), or black; ball of diameter (50); centred at (200, 200); and filled with colour (0,255,0), orgreen.

For part (b), a sensible answer would explain that the code checks whether the ball has reached the bottom edge of the screen, and if so, the ball's velocity is reversed.Hence, this code implements collision detection/bouncing on the floor. While most candidates knew what the code does – checks whether the ball has reached the bottom edge –not all explained the effect of the code.

For part (c), only a few candidates showed understanding that a downwards acceleration, namely gravity, is being applied in the *y* direction, and hence an upwards travelling ball will eventually come to rest momentarily in the negative *y* direction and then start moving in the positive *y* direction.

Part (d) required candidates to provide one-sentence definitions for the concepts of velocity and acceleration. Despite this being a bookwork question, with appropriate definitions given in the subject guide, not all candidates included direction as being central to these definitions.

For part (e), many candidates correctly explained that there is no acceleration in the `x` direction as the magnitude of `dx` is never changed. However, there is instantaneous acceleration when the ball hits the floor. A mention of the instantaneous acceleration, or comparison with the case in the `y` direction – where there is acceleration supplied by gravity – obtained full marks.

Part (f) could be simply answered by either deleting line 14 ("`background(0);`") or moving it to the `setup()` function, and then adding the following three lines at the start of the `draw()` function, that is, after line 13:

```
fill(0,50); // or other small alpha value
rect(0,0,width,height);
fill(0,255,0);
```

Examiners also expected the requested explanation for full marks to be awarded. Finally, for part (g), a simple response of modifying line 20 to read:

```
dy = -0.95*dy;
```

obtained half the available marks. However, this will run into difficulties when *dy* gets smaller than the radius of the ball because adding *dy* to *y* might not be enough to get it above the ground level again. So we would need to add a second test to line 18:

```
if ( y > height - ballSize /2 && dy > 0)
```

Explanations that showed understanding of this obtained the rest of the available marks.

Question 5: Generative systems

Most candidates answered this question, and it was the best answered overall, with an average of 16 out of the available 25 marks, which is an upper second for this question.

Most candidates correctly answered, for part (a), that the initiator is the `state` variable with the value "F", and the generator is the `F_rule` variable with the value "F[-F]+F".

For part (b), again most candidates could explain the effect of `noLoop()` and that it is appropriate because in this case, the `draw()` method draws the whole pattern and there is no need to redraw it on eachframe.

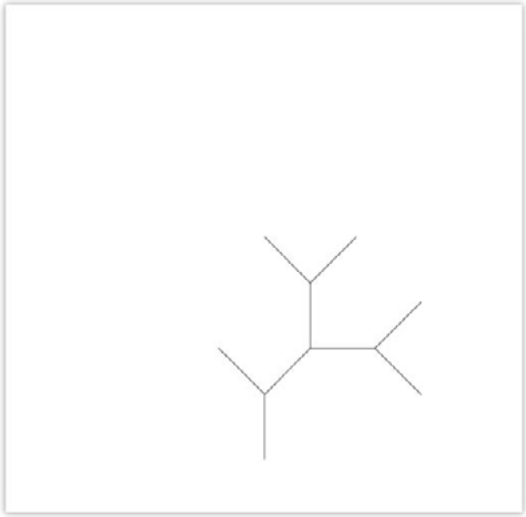
Part (c) was also straightforward and generally answered well. The commands save and restore the position and rotation of the currentdrawing frame. Some candidates did not mention that rotation is included in the position, and others did not explain why they were useful, there by losing some of the available marks.

For part (d), a clear answer would explain that the code does not use recursion; this would require a call to `substitute` within the `substitute` method itself. Instead, it calls the `substitute` method multiple times within a `for` loop.

Part (e) was well answered; almost all candidates correctly stated that the line outputs the string F[-F]+F[-F[-F]+F]+F[-F]+F

For part (f), most candidates were able to describe that the function will draw a line from the current origin to point (100,0), though not all included the fact that it will also move the origin or drawing head to the end of the line.

Finally, for part (g), a drawing similar to the one below was expected, with co-ordinates marked at (400,700) for the first point and around (641, 600) for the last.



Question 6: 3D motion and sound

This was one of the least popular questions, chosen by only around one third of candidates, but it was reasonably answered by those who attempted it.

Part (a) was generally well done,and candidates were able to produce diagrams with a large sphere of radius100 in the centre of screen (250,250,0), and shown in wire-frame with red lines. Most candidates also included the small sphere of radius10, 200 units to the right of it, labelled as point (450,250,0), and also drawn in wire-frame but with blue lines.

For part (b), again most candidates correctly answered that the "satellite" appears to orbit the "planet" around the y-axis (on the x-z plane), and that it takes 10 seconds to return to its initial position.

For part (c), candidates were able to explain that the command controls the number of vertices used to draw the sphere, or said that it specifies the number of segments used per full circle revolution. Not all explained advantages and disadvantages, such as using a high number creates a smoother sphere, but is slower torender.

Part (d) was not always answered comprehensively. In this instance, the behaviour would change, because the rotation would happen around the left-hand side of the screen, on the y-axis at global (x-pos,0) rather than at global (x-pos,250). In general, the order of transformations matters unless they are all

only translations, and examiners were expecting candidates to demonstrate understanding of this.

For part (e), it is possible to use the `camera()` function, which takes 9 parameters: eyeX, eyeY, eyeZ, lookX, lookY, lookZ, upX, upY, upZ. Another acceptable approach would be to use the `beginCamera()` and `endCamera()` functions appropriately.

Most candidates showed good understanding of the audio aspects of part (f). To use the sound library, the required command is:

```
import processing.sound.*;
```

A simple approach for part (f)(ii) might be to create a new `SoundFile` global variable at the start of the sketch, for example "`SoundFilemyMusic;`". This would need to be initialised in the `setup()` method, for example "`myMusic=newSoundFile(this, "planets.wav");`". Finally, the play method would need to be called, also within the `setup()` method, for example "`myMusic.play()`".