Mobile HCI for MSc Coursework 2024-2025

1. Assessment Groups

For this assessment you will need to be in a group of **5 people**. You are responsible for creating your own groups. Your course coordinators can help you find a group at the beginning of the labs. Please find a group quickly, so you have more time to work on the assessment.

Remember, people can contribute to your project in a variety of ways, with contributions varying across the semester. For example, Person 1 may produce most of the prototypes, Person 2 may take the lead in running remote evaluations, Person 3 may participate in other teams' evaluations and work on the report, Person 4 may do most of the implementation. Be fair to each other and communicate well to avoid any issues arising over perceived unfair contributions. Also reach out to us by email if you have any concerns within your team.

2. Scenario

Your team have been hired by a mobile device manufacturer to design innovative interactive experiences that showcase the capabilities of their upcoming mobile devices (a **flexible phone**, a **smartwatch**, a pair of **augmented reality glasses**). They would like your designs to show how their new devices can be used to encourage outdoors exercise. They are open minded about how you address this design brief, but have asked for your designs to use novel interaction techniques, use multiple sensory modalities, and use **at least two** device types.

Figure 1: Examples of the future hardware capabilities your project might consider, although you are not required to use any of these demonstrated features.

You should be creative. Imagine the capabilities of future mobile devices or draw inspiration from cutting-edge HCI research, rather than being limited by the technical capabilities of today's hardware. Your designs can be as imaginative and innovative as you want, but you will need to be able to prototype them (simulating functionality is acceptable).

You should be conscious of **user safety**. Your users may be exercising (e.g., running or cycling) in public spaces, shared with other pedestrians, vehicles, etc. Consider the **attention demands** of your interactions: how might you present information to your users to reduce distraction? Also consider the **interaction challenges** arising from exercise: how does physical activity and mobility affect users' ability to provide input and perceive output? There are a lot of design possibilities, using the many sensory modalities and device types available.

For this assessment, focus on interaction design and evaluation, not engineering. We want to see you create innovative designs that are refined through evaluation. You will need to create prototypes of your designs, using an appropriate form of media for the design process (e.g., sketches, paper prototypes, digital wireframes, partly-implemented prototypes).

Your final prototype does not need to be fully functional, but needs to be interactive for both demonstration and evaluation purposes. You could 'implement' this prototype using design tools (e.g., Adobe XD or Figma) or software (e.g., Android development, web-based apps in a browser). Focus your attention on **interaction**, rather than functionality. It is acceptable to simulate or fake the behaviour of your prototype for the purpose of evaluation: e.g., using 'Wizard of Oz' techniques[1] to fake gesture or speech recognition, or using images and videos to simulate the output from an augmented reality headset.

2.1. Summary of scenario requirements

You must:

- Create an interactive experience that encourages and/or supports outdoors exercise;
    - e.g., cycling, running, any exercise is fine;
- Incorporate novel interactions;
    - e.g., context-, location-, or sensor-based interactions;
- Make use of multiple sensory modalities;
    - e.g., audio or haptics output, gesture or speech input;
- Use at least two mobile devices;
    - i.e., flexible smartphone, smartwatch, augmented reality glasses;

[1] "Prototyping: Learn Eight Common Methods and Best Practices": https://bit.ly/2GnyGaG

3. Project Outline

You should use an iterative interaction design process, following the principles introduced during the course. Throughout this design process you should be producing prototypes, documenting your design decisions, evaluating your prototypes, and keeping notes on your findings. Your final submission will include a report that describes your work and these artefacts are evidence of the process you followed.

We want to see evidence that you have considered and evaluated multiple interaction designs; we do not want the report to only present a single design from start to finish. By prototyping and evaluating alternative designs, you will be able to clearly justify the decisions that led to your final design. We also want to see variety: use a variety of prototyping methods, use a variety of evaluation methods (at an appropriate stage in the process).

4. Design Process Outline

You are free to follow whatever design process you like, but the next sections give suggestions of activities you may wish to consider and include in your report.

4.1. Step 1: Understanding the Requirements

Think about the requirements and how you might satisfy them. Consider questions like:

- What type of exercise activity are you going to focus on?
- Who are your intended users?
- What might their motivations be for using an app or interactive experience like this?
- What could you do to encourage or support them in this form of exercise?
- What interaction challenges arise from this form of exercise?
- How can you incorporate each of the two device types?
- How can you incorporate non-visual interactions?
- What are the unique selling points of your ideas?

At this stage, you may wish to think about what existing solutions look like. What smartphone apps already exist for exercise? How do they support or encourage participation? Are they aimed at enthusiastic athletes or complete beginners? Look at existing solutions and think about how users interact with them. Think about their experience when using these existing solutions. What do you think is good and bad about these? What features do existing apps have that help users? Can you identify potential improvements? The aim of this exercise is to break away from traditional exercise apps and come up with something exciting and innovative, incorporating state-of-the-art mobile interactions using cutting-edge mobile devices.

By the end of this step, you should have a better understanding of your users, an awareness of existing solutions and their core interactions, and a set of possible features for your project. There are many potential outputs from this step of the design process. For example, an app definition statement, a list of core requirements, user personas, storyboards. Use these initial

outputs as inspiration for the rest of the design process. Remember, these are not final and can be changed as needed.

4.2. Step 2: Concept Generation

Begin your interaction design process by coming up with creative ideas about how you can satisfy your project requirements. What will the core interactions with the system be like? How will users provide input and how will output be presented to them? You may wish to use storyboards at this stage to develop your ideas.

Come up with as many interaction ideas as possible. Be as creative as possible. Try to envisage alternative ways of accomplishing the same goal. Consider all of the usage contexts. Think about all aspects of the interaction:

- How is interaction initiated?
    - Does the user take an action? Is an action triggered by context? etc
- What is presented to the user?
    - What does the screen look like? Is there audio? Is there vibration? etc
- What can the user do next?
    - Is input required? What can they do next? Where do they go next? etc

You may find it helpful to divide the group at this stage, come up with your own design alternatives, then discuss your ideas together afterwards.

Remember: notes, sketches, etc., from this stage can be helpful when you write the final report.

4.3. Step 3: Initial Prototyping

Take your favourite design ideas from before and begin creating sketches or paper prototypes. The aim of creating paper prototypes is to be able to quickly evaluate and refine them. Don't be a perfectionist, don't spend too long making them look beautiful – because you will change and discard ideas that don't work! Think about how you can sketch and prototype interactions for wearable devices like smartwatches and augmented reality glasses. Use your imagination and think about how you can convey elements of your designs through paper.

At this stage in the process, you should focus on individual interactions, rather than the complete app. For example, you may prototype two methods of presenting information to the user, or you may prototype three ways of giving the user feedback about an action. Evaluate the interactions on their own at this stage because you want to identify the best ones to later combine in a complete app. Continue to iteratively design and evaluate your paper prototypes until you converge upon one or two designs that look like promising candidates.

Remember: keep copies of your prototypes, take photographs to help document the design process, and take notes about your findings. You may also find it helpful to directly annotate the prototypes. As before, any notes, photos and images from now will be helpful when you write the report.

Advice: in the early stages of design, it is acceptable to evaluate your designs within your teams. You may take on the role of usability experts rather than designers. You will also need to test with other people. Evaluate with naïve users who do not know about your designs. They are not familiar with your designs, so will be the best people to help you understand any weaknesses that need to be improved. For example, it may be obvious to you which button to press or which speech command to give, but an unfamiliar user may have difficulty.

Advice: help each other! There will be many project teams needing participants for evaluation. Remember that participating in evaluation counts as work towards this project, so one person in your team could spend an hour evaluating other teams' projects while the rest of you evaluate your own designs.

4.4. Step 4: Refined Prototyping

By now, you should have a robust set of interaction designs that you have prototyped and evaluated. You should next start to think about how the individual interactions fit together, to create a cohesive interactive experience. For this, you may prefer to switch to using higher-fidelity prototyping, by creating digital wireframe layouts (although paper is still okay). These should emphasise the core aspects of your designs and should represent how you envisage the final product.

Your prototypes at this stage should be sharply focused on the core requirements for your app. They should fit together to create a cohesive interaction experience. Remember, focus on the core requirements and the core experience outlined by your app definition statement; avoid "feature creep" and introducing too many inessential interactions.

Evaluate your refined prototypes again. At this step, you should use an interactive evaluation method – with people 'using' your prototypes or giving feedback on them. For example, you might use the Think Aloud method, with Wizard of Oz elements to provide the system response. The Think Aloud method is about knowing what your users are thinking, not just what they are doing. It should focus on both positive and negative aspects of interaction. Encourage your users to talk while performing tasks and prompt them to tell you things like:

- What they are thinking;
- What they are trying to do;
- What questions arise as they interact with your prototype;
- The things they read;
- The things they try to interact with;
- How they think a task should be accomplished;

You may wish to make an audio or video recording of this process (with the participant's permission), so you can analyse it in more detail later. Take field notes about your observations and your users' comments. Divide responsibilities between your team: one person can prompt

the participant with questions, one person can take notes, one person can be the Wizard of Oz to facilitate the interaction.

Remember: all notes, recordings, images, etc., will be useful when it is time to write the report. Also, make sure you reflect on the evaluation process: what are the key outcomes?; what decisions did you make as a result of evaluation?; how will you refine your designs? etc

Advice: as before, help others – you do not need all members of your group to run an instance of an evaluation, so help out other teams by being a participant for them. Get as many participants as possible. You could pair up with another team so that everyone can take part in evaluating the other team's prototype.

4.5. Step 5: Implementing a Demonstrator Prototype

You should now have an idea of what your final design is going to look like. Your evaluation results from the previous iterations should have helped you consolidate your design. Refer back to your app definition statement and storyboards: are these still valid, or do they need updated?

Now you should begin to create an interactive demonstrator prototype. Remember, the emphasis of the exercise is on the user interface and the interaction design, not a fully functioning implementation. You may choose to implement interactive prototypes using any software platform you like (e.g., native smartphone apps, web-apps in a browser, a Java or Python window shaped like a smartphone). For the smartwatch and augmented reality glasses, it is fine to simulate these (e.g., using differently sized windows in a browser, using Android Virtual Devices, or as a video that plays at the same time as the user interacts).

We are not going to consider the quality of the code when assessing your work. It is up to you to determine how you will build your prototype. It needs to be **interactive** and have sufficient functionality for you to **evaluate** and **demonstrate** it. As mentioned earlier, it is completely fine to 'fake' behaviour. You do not necessarily need to produce software.

Your final activity on the project will be to evaluate your prototype. You can use similar methods as before, but this time, your prototype should be fully interactive. The aim of final evaluation is to determine if your design is a success. No app is ever perfect first time round, so be honest in your report about what you learned and what you could improve if more time was available.

5. Report Submission

You should submit a report (maximum 10-pages, with additional images, data, etc, included as appendices). Use the template available on Moodle (an Overleaf template will be provided).

Key points:

- The first page should include all student names and matric numbers for your team;
- Discuss **Step 1** activities used to understand the requirements and users:
    - Include your app definition statement (*required*);

    - Describe your user persona(s) (*required*);
    - Include and describe your storyboard(s) (*required*);
- Discuss **Step 2** activities used to generate interaction concepts:
    - Describe the main interaction concepts at this stage;
- Describe the paper prototypes and designs that were evaluated in **Step 3**:
    - What interaction designs were illustrated by these prototypes?
    - How did you evaluate them?
    - What did you learn from your users?
    - What will you keep, refine, or discard?
    - Include photographs of prototypes, annotations, etc. (in appendices if necessary)
- Describe the prototypes and designs that were evaluated in **Step 4**:
    - Describe the main changes from before;
    - How did you evaluate them?
    - What did you learn from your users?
    - What will you keep, refine, or discard?
    - Include any relevant wireframes, annotations, etc. (in appendices if necessary)
- Describe the final implementation and evaluation from **Step 5**:
    - Discuss how you implemented your final prototype;
    - How did you implement, or fake, the interactions for your evaluation?
    - How did you evaluate the final prototype?
    - What did you learn from your users?
    - What changes would you make in future?
- Include an overall discussion at the end of the report:
    - What novel interactions did you choose to focus on in this exercise?
    - How did you incorporate multiple mobile devices into your designs?
    - How did you make use of multiple sensory modalities in your designs?
    - What did your evaluations tell you about these interactions?
        - Were they successful? Would this be worth deploying in a real system?
    - Were there any themes throughout your evaluations at all stages in the process?

6. Marking

This exercise is worth 40% of your overall Mobile HCI for MSc grade. Your coursework submission will be assessed as follows:

- Design process (design, prototyping, evaluation): 60%
- Final prototype & evaluation: 25%
- Report quality: 15%