

# **COMS3029 Human-Computer Interaction**

## **Week 1 Practical: First Wave of HCI**

### **SESSION OVERVIEW**

In this session we're going to explore the KLM-GOMS model of user interaction. This is a quantitative cognitive model of user behaviour developed in the 80s, which has been developed in the intervening years, and is still in use, in industry. At the end of this worksheet you can find a video guide from Atlassian on how User Experience teams can apply the approach in their own work.

First we'll have a quick refresher on KLM-GOMS and how to use it. Next you'll apply the model to understand a simple task: filling in a questionnaire. We'll evaluate two different designs for the questionnaire and see which is the most efficient.

After that we'll test out our times, by trying out the interfaces by ourselves on a web page. Finally we'll discuss how we might use GOMS, and what the consequences might be of focusing on these kinds of metrics in interface development.

Note: as with all of the activities we'll do, everything here is potentially relevant to exams and coursework!

### **GOMS REFRESHER:**

KLM-GOMS or Keystroke Level GOMS is a model that predicts task execution time. You start with a specified design and particular task scenario. You then just list the sequence of “Keystroke level” actions the user must perform to accomplish a task, and then add up the times required by the actions. The timings in GOMS have been validated over decades by various studies, and proponents claim that it can now specify task execution times, on appropriate tasks, to within 10-20%

“Keystroke level” here means anything at roughly the same level of atomicity as a keystroke on a keyboard: for example pressing keys, moving the mouse, pressing buttons, and so forth. This is to distinguish it from “higher level” actions like “enter the password”, “Log onto the system”, or “go to facebook and make a social media post”.

What’s nice about this for design teams is that not only does it not require user testing, it doesn’t even require you to have implemented your design. You just need the interface to be specified in enough detail that you know what actions the user will perform, and in what order, for a set of defined tasks. This means you can start with a bunch of outlines for candidate designs, and evaluate them before you spend designer and developer time on refining them.

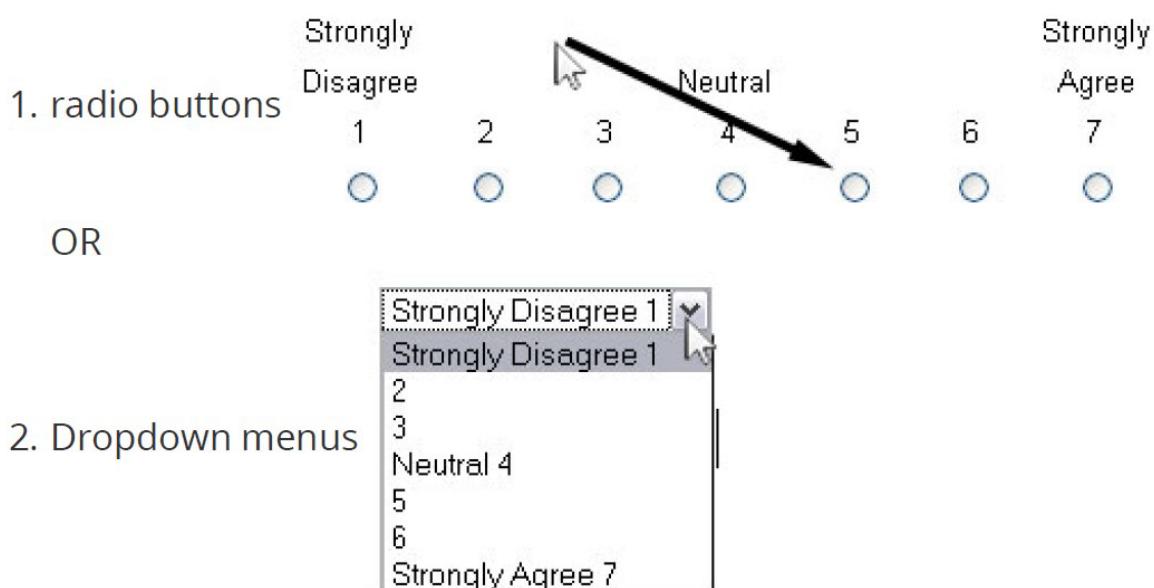
### **The general overview of a KLM-GOMS analysis is as follows:**

1. Choose one or more representative task scenarios.
2. Have the design specified to the point that keystroke-level actions can be listed for the specific task scenarios.
3. For each task scenario, figure out the best way to do the task, or the way that you assume users will do it.
4. List the keystroke-level actions and the corresponding operators involved in doing the task.
5. If necessary, include operators for when the user must wait for the system to respond
6. Insert **mental** operators for when user has to stop and think.
7. Look up the standard execution time to each operator.
8. Add up the execution times for the operators.
9. The total of the operator times is the estimated time to complete the task.

# 1) Calculate the predicted time to fill in a questionnaire, using 2 different UIs

A common way to use GOMS is to decide which of two (or a few) interface designs to use. We're going to do a very basic GOMS analysis to help you get the feel for how it works.

We have two different candidate designs for a questionnaire UI. The question you need to answer is - **should we use radio buttons or dropdown menus:**



As we said in the lecture, GOMS analyses tasks into **GOALS, OPERATORS, METHODS, and SELECTION RULES**

in this simple example the **Goal** is obvious: complete the questionnaire. We're just going to define just one **Method** because the task is very simple. Remember, in GOMS, a **Method** is the execution plan which the user is theorised to hold in their brain as a representation, for how they will achieve this kind of **Goal** - e.g. how they will complete the questionnaire.

We're not going to play with **Selection Rules** (rules for how the user will decide which method to use),

That just leaves **Operators** Here's the set of original operators from KLM, which was found by the researchers who created the model to be sufficient to construct most tasks, and which we'll use here.

**Homing:** Moving Hand to Keyboard or Mouse: 360ms **Clicking:** the Mouse: 230 ms

**Pointing:** with the Mouse: 1100ms

**Mental Operations:** (Deciding what to Do): 1350 ms

## The interface you'll analyse

Very simple: this is just a 3 question form, where each question can be answered using the UI elements shown above.

There are two candidate designs. One uses 3 radio buttons. One uses 3 Dropdown menus. For each form design, break down the task into the operators above, then calculate the time.

## What to do

To perform this simple GOMS analysis, first create a shared excel sheet, or google sheet for your group.

Then, go through the KLM-GOMS procedure listed above, for each of the interface designs - radio buttons, and dropdown menus.

Steps 1 and 2 of the procedure have been done for you here - you know the task you know the two interface candidates.

Discuss in your group how you would break down the task for each interface (radio/dropdown). Record your steps, and the times for each interface in the shared spreadsheet.

## 2) Test your results

- *Download Seminar2\_AmazingWebsite.html* from the general files folder and open it in your browser (you need to download and open in firefox/chrome etc. NOT IN TEAMS!). This has examples of the two interfaces you just analysed, and a timer.

- For each version, Click “start”, then fill in the form, then click “finish”. The web page will tell you your time on the task
- Record both of your times, and share with the group, then work out the averages for your group
- How do your individual times compare to the predicted times?
- How do the group times compare to the predicted times?
- GOMS is supposed to predict within 10-20% of the correct time. If you're way off this check your analysis with your TA (but you may just be amazing at filling in questionnaires. When this becomes an e-sport the money will roll in).

### **3) Discuss in your group**

- How might GOMS be used in design?
- What are the benefits of using this in a design or development team?
- What are the limitations
- What are some potential outcomes of using this kind of approach
  - as an individual (focusing on your own work),
  - as an organisation (focusing on the outcomes for the product/ your customers)
  - as a profession? (society-wide impact on how technology is designed)

### **4) Optional extras**

If you have time, watch this video from Atlassian discussing how dev teams can make use of GOMS. Then discuss in your group <https://www.youtube.com/watch?v=QQJkETJYryw>