CS 6750 Human-Computer Interaction
Assignment P4

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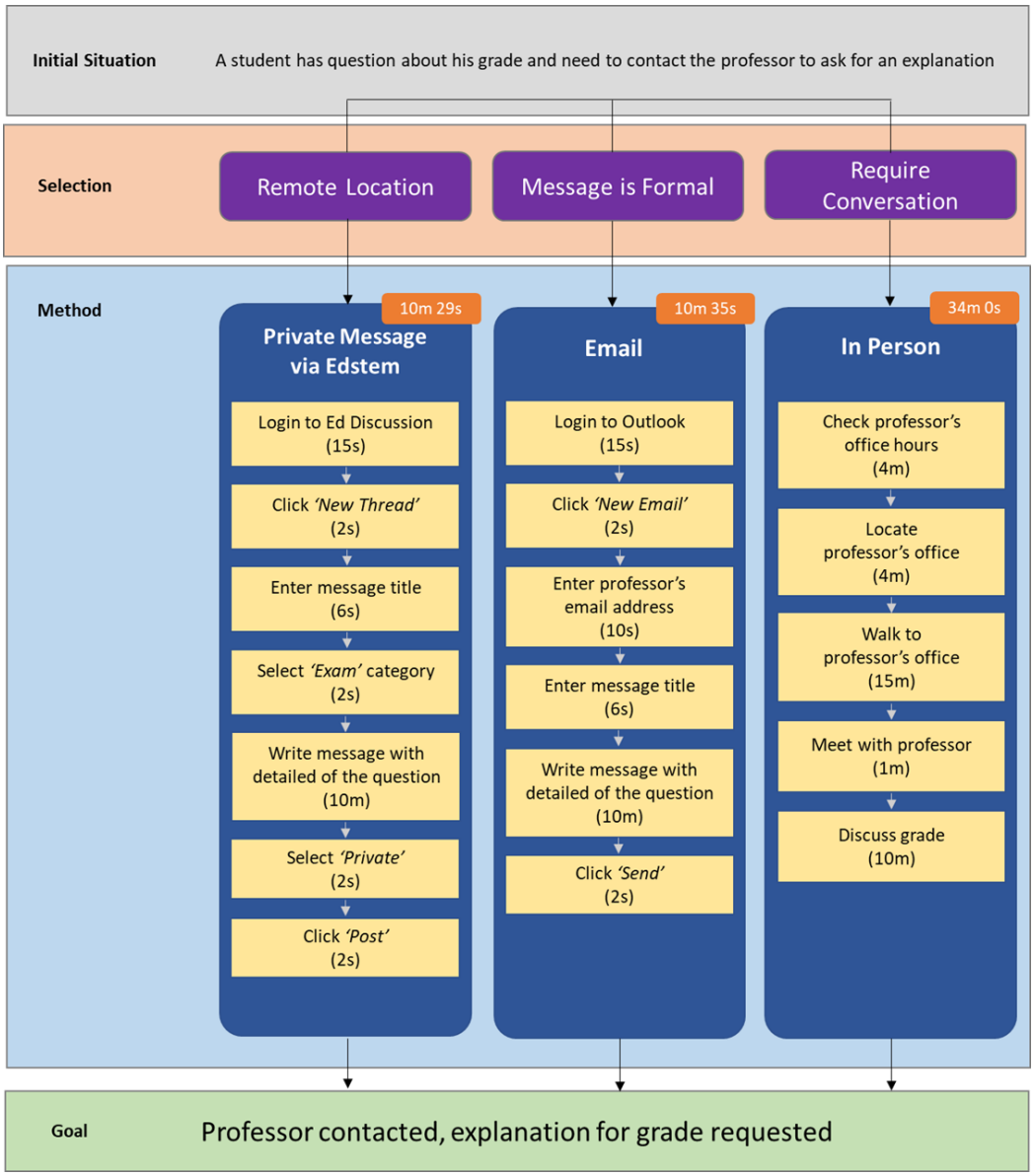
1 QUESTION 1: GOMS MODEL

Figure 1: GOMS model for contacting a professor



2 QUESTION 2: HIERACHICAL TASK ANALYSIS

1 Complete an Assignment

1.1 Submit Assignment to Canvas

1.1.1 Login to Canvas

1.1.1.1 Open Chrome browser

1.1.1.2 Enter Canvas URL

1.1.1.3 Enter GT account

1.1.1.4 Enter GT password

1.1.1.5 Hit 'LOGIN' button

1.1.2 Complete Two-Factor Authentication

1.1.2.1 Click *'Send Me a Push'*

1.1.2.2 Pick up mobile device

1.1.2.3 Click '*Approve*' on the Duo Push Notification

1.1.3 Navigate to CS6750 Course Page

1.1.3.1 Move mouse pointer to *'Courses'* on the left panel menu

1.1.3.2 Click *'Courses'* on the left menu

1.1.3.3 Click on *'CS6750: Human-Computer Interaction (SU21)'* under listing of *published courses*

1.1.4 Navigate to Assignment Page

1.1.4.1 Click *'Assignments'* on the left panel menu

1.1.4.2 Scroll down list view until *'Assignment P4'* appears

1.1.4.3 Click *'Assignment P4'* under *Upcoming Assignments*

1.1.5 Upload Assignment File

1.1.5.1 Click *'Start Assignment'* button

1.1.5.2 Click *'Choose File'* button

1.1.5.3 Locate the *P4 assignment pdf* in file folder

1.1.5.4 Click the *P4 assignment pdf*

1.1.5.5 Hit *'Open'* button

1.1.6 Submit Assignment

1.1.6.1 Click the checkbox to accept *End-User License Agreement*

1.1.6.2 Click *'Submit Assignment'* button

1.1.6.3 Wait for the "Submitted!'' message to appear with date and time stamp of submission

1.2 Receive Grade and Feedback

1.2.1 Check Email Notification

1.2.1.1 Open *OUTLOOK* app

1.2.1.2 Look for new email with title: *Assignment Graded: Assignment P4, CS6750 Human-Computer Interaction (SU21)*

**Repeat steps 1.2.1.1 and 1.2.1.2 daily until email is received*

1.2.1.3 Click on the email hyperlink to view message

1.2.2 Login to Canvas from email message

1.2.2.1 Click *'You can review the assignment here'* hyperlink

1.2.2.2 Wait for Georgia Tech login page to load

1.2.2.3 Enter GT account

1.2.2.4 Enter GT password

1.2.2.5 Hit *'LOGIN'* button

1.2.3 Complete Two-Factor Authentication

1.2.3.1 Click *'Send Me a Push'*

1.2.3.2 Pick up mobile device

1.2.3.3 Click *'Approve'* on the Duo Push Notification

1.2.4 View Grade and Feedback on Canvas

1.2.4.1 Wait for the *'Submission Details'* page to load

1.2.4.2 Scroll to top right of page

1.2.4.3 Read assigned grade

1.2.4.4 Scroll down to the feedback module

1.2.4.5 Read feedback posted by TA

3 QUESTION 3: SYSTEM ANALYSIS DISTRIBUTED COGNITION & SOCIAL COGNITION

3.1 Distributed Cognition: Navigation without GPS

In this assignment, we will explore *distributed cognition* model for a navigation system comprised primary of a married couple (driver and passenger), a map and road signs. Cognitive loads are distributed across each member that when act as whole, accomplishes the goal of arriving at the predetermined destination.

Figure 2 – Navigation without GPS

System Member	Cognitive Tasks			
	Perception	Memory	Reasoning	Action
Driver				
Passenger				
Map				
Road Signs				

- **Driver** – The driver's primary responsibility is to control the vehicle. To do so successfully, he has to constantly perceive the environment and reason to take appropriate actions that ensure arrival at the destination safely. He must monitor other traffics and signs on the road, read the indicators on the dashboard and take navigation instructions from the passenger. He then translates these inputs which require some level of cognitive reasoning into appropriate actions of driving the car (i.e., steering the wheel, pushing the accelerator, making a turn or braking). The driver also needs to predict what other cars will do and response quickly to potentially hazardous situation to avoid accidents from happening. Cognitive load for the driver is very high.

- **Passenger** – The main role of the passenger is to provide timely navigation instructions to the driver. The passenger will need to read the map, perceive landmarks and road signs, and finally judge the current geographical coordinate of the vehicle to determine the next navigational direction for the driver (i.e., inform the driver when to turn or which exit to take). The passenger can also perceive the environment and help alert the driver of potential safety hazards along the trip.

- **Map** – The map is a vital memory component of the system. It can serve in the following ways:
    a) ***Long Term Memory***: Graphical representation of all routes within the geographical area covered by the map.
    b) ***Short Term Memory***: The driver and passenger can plan the trip ahead of time by marking the specific route for the entire journey.
    c) ***Working Memory***: By tracking and marking the completed portion of the route during the journey, the map becomes a working memory that will assist the user to identify navigational directions.

- **Road signs** – These act as the ***working memory*** for the system. Road signs provide immediate information to the couple about current location, specific direction or exit on a highway, speed limits, and warning on potential hazards along the route.

3.2 Compare and Contrast

In the scenario of a *lone driver using a GPS*, the GPS takes over the roles of the passenger and the map to provide navigational assistance for the driver. In general, GPS is very efficient at computing accurate routes and more reliable than a person reading a map. It also detects if the driver missed a turn and automatically re-route. On the negative side, the GPS lacks the ability to recognize changing conditions such as road closures, accidents, weather change etc. Thus, a person is better than GPS when it involves responding to change and reasoning for the best alternative. This lack of context-awareness is a key limitation found among non-human artifacts.

Figure 3 – Navigation with GPS

System Member	Cognitive Tasks			
	Perception	Memory	Reasoning	Action
Driver				
GPS				
Road Signs				

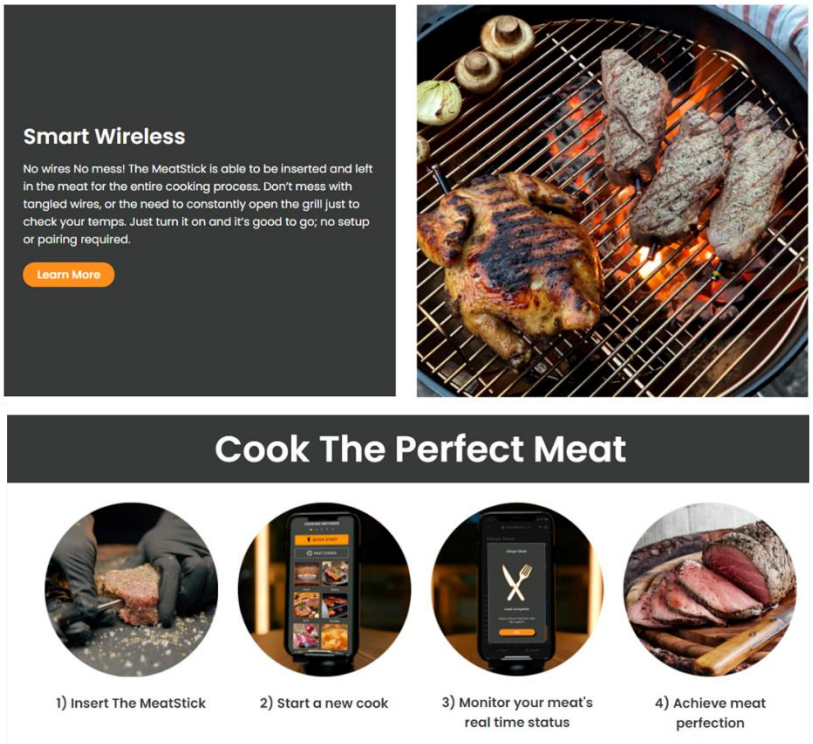
When we take the view of **social cognition**, it further reveals many other factors that may help or hinder the success of the navigation system. We must also consider social relationships, emotional dynamic, learning and perception in a social environment that affect the operation of the system. The relationship and emotional state between the couple will likely impact communication and how well they work together to accomplish the task. For example, if the couple is in mid of an argument, the driver may not be as willing to accept instructions from the partner. Vice versa, the passenger may feel reluctant to assist the driver. Moreover, emotional stress could also impact the ability to perceive and respond because it increases the cognitive load. This often leads to higher risk of accident. On a positive note, a passenger may also make the trip more enjoyable to keep the driver engaged. The positive social interactions between the driver and passenger can uplift mood, help reduce fatigue and increase driver's alertness, resulting to a safer trip. In short, with strong relationship and communication abilities, members can work well together, ensuring a smooth and successful operation of the system.

4 QUESTION 4: DISTRIBUTED COGNITION VIEW ON ANOTHER EXAMPLE

4.1 System for Grilling Steak with Smart Thermometer

Grill steak is my all-time favorite. As a novice cook, the steak usually turns out to be undercook or overcook. This is perhaps my biggest challenge. To get the meat right, we need to consider the type and thickness of the meat, and how well the temperature and cooking time are regulated. It is very important to get these right. The good news: with smart devices and sensing technology today, it is becoming a lot easier to grill the meat to perfection. Here, I will describe a system that allows me to just do that. Taking the view of **distributed cognition**, the system is comprised of the cook (me), *MeatStick* wireless thermometer, *MeatStick* mobile app and a gas grill. The task here to grill a steak. The goal is to have a juicy steak cooked to medium-rare, which is what I prefer.

Figure 4 – Grilling Steak System with Smart Thermometer



4.2 System Components and Cognitive Tasks

Here is a breakdown of the system above. It shows how each component takes a role in various cognitive tasks to cook the perfect steak.

Figure 5 – Cognitive Tasks Distribution of the Grilling System

System Member	Cognitive Tasks			
	Perception	Memory	Reasoning	Action
Cook				
MealStick wireless thermometer				
MealStick app				
Gas Grill				

- **Cook –** This person is the main orchestrator. He is responsible of reasoning, perceiving, and executing actions with each interface involved. First, he must determine the choice and preparation of the meat. The

reasoning over the cooking time and temperature is larger assisted by the *MeatStick* mobile app to make this task so much easier to execute. The wireless thermometer significantly reduces the cook's perception task. Once everything is setup correctly and turned on, the cook can leave it alone. He does not need to constantly measure the temperature or keeping track of the time because this responsibility has been offloaded to the app and sensor. However, it is still important for the cook to ensure each stage is completed as expected. The final action is to take the steak off the grill once he has been notified by the app.

- ***MeatStick* wireless thermometer** - This component is a temperature sensor that is inserted to the meat. The main task is to sense the internal temperature of the meat in real time, and then send the data back to the *MeatStick* mobile app.

- ***MeatStick* mobile app** – The mobile application perceives the signals transmitted by the wireless thermometer and displays the temperature reading on the screen interface. It also serves as the memory component by storing the ideal settings for steak temperatures and cooking time. This offloads the user from having to remember all this information. While cooking, the app continues to monitor the temperature and elapsed time, and finally notify the cook when the steak is ready. This plays a critical role to cook perfect meat by controlling accurate cooking temperature and time.

- **Gas grill** – The grill is performing actions of heating up and controlling the flame to cook the meat. It regulates the amount of gas feeding into the burners. Most grills also come with a great looking thermometer build into the hood that senses cooking temperature. However, this feature is not very useful. It gives reading of the air temperature near the top of the hood. Not where the food is cooking. Therefore, we should not rely on it. We can get more accurate temperature reading with the *MeatStick* wireless thermometer.