HCI – CS6750 Assignment P4

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1 QUESTION 1: GOMS MODEL

1.1 Initial Situation

The first step in creating a GOMS model is identifying the initial situation. This is that a student needs to contact a professor to ask for an explanation of a grade.

1.2 Methods and Method Selection

The second step is identifying the methods and method selections.

a) Email method - If any part of the communication contains sensitive information, such as test or assignment answers, the student will email the professor.
b) Ed Discussion method - If any part of the communication might be advantageous to a larger group, the student will choose to send a private Ed message to the professor via Ed Discussion. At the professor's discretion, the post can be made public if advantageous to the class.
c) Virtual office hours method - If the communication needs to take place face-to-face, the student will choose to join the professor's virtual office hours.

1.3 Operator and Goal

The operators, defined in the third step of GOMS model creation, are the series of tasks the student will take to carry out the methods and thus achieve the goal. The following table is a visualization of the GOMS model, including the operators and accomplishing the goal.

Table 1 — GOMS model for student request to a professor.

Method	Selection Rules	Operators	Cost (Time)
Email	The student request contains sensitive information	(1) Open Email (2) Click "New Message" (3) Compose Message (4) Attach assignment	60 seconds 5 seconds 350 seconds 30 seconds

Method	Selection Rules	Operators	Cost (Time)
		(5) Send Email	5 seconds
Private Ed Discussion	The student request contains information that could be useful if shared with whole class.	(1) Open Web Browser (2) Navigate to Ed Discussion URL (3) Click "New Thread" (4) Compose message (5) Select "Private" (6) Post message	90 seconds 60 seconds 10 seconds 350 seconds 10 seconds 5 seconds
Virtual Office Hours	The student needs to have a conversation with the professor face-to-face	(1) Determine the professors' office hours (2) Gather meeting information (3) Join meeting (4) Converse with professor (5) Disconnect from meeting	120 seconds 60 seconds 120 seconds 600 seconds 15 seconds
FINAL GOAL			
After choosing the method and executing the operators, the student has successfully contacted the professor to ask for an explanation of a grade and achieved their goal.			

2 QUESTION 2: HIERARCHICAL TASK ANALYSIS

The following hierarchical task model analyses the task of submitting this assignment to Canvas and subsequently receiving one's grade and feedback.

- Complete Assignment P4
    - Navigate to the CS6750 syllabus
        - Login to Canvas
            - Navigate to https://gatech.instructure.com/
        - Select CS6750: Human Computer Interaction course
        - Click on Syllabus link
    - Read over the required materials to complete Assignment P4
    - Navigate to Ed Lessons
        - Click on the Ed Lessons link in the Canvas course dashboard
    - Watch required lessons
        - Click on the link to "2.7: Task Analysis"
        - Watch all required lessons
        - Click on the link to "2.8: Distributed Cognition"
        - Watch all required lessons

- Read Assignment P4 instructions
    - Open Assignment P4
        - Navigate to the CS657 syllabus
        - Find Assignment P4
        - Click the Assignment P4 link
- Complete Assignment P4
    - Open "JDF2.2-Starter.docx" template
    - Answer questions
    - Save document in .pdf format
- Submit assignment to Canvas
    - Click on Assignments link in Canvas
    - Click on Assignment P4 link
    - Click Start Assignment
    - Attach Assignment P4 .pdf file
        - Select Assignment P4
            - Click Choose File
            - Navigate to where Assignment P4 is saved
            - Highlight the file
            - Click Open
    - Click Submit Assignment

- Receive Grade and Feedback for Assignment P4
    - Check email for Assignment P4 grade release
        - Log into GA Tech email
        - Search for the Assignment P4 grade release email
    - Log into Canvas
        - Select CS6750: Human Computer Interaction course
    - Click on the Grades link
    - Click on the Assignment P4 link
    - View assignment grade
    - View assignment feedback
        - Scroll down if applicable to view all feedback

3 QUESTION 3: DISTRIBUTED COGNITION

3.1 Distributed Cognition Model of Navigating Without GPS

In a time prior to GPS being available for navigation, the need for maps and directions existed. The system for navigation without GPS would be compromised of artifacts such as a driver, a passenger, a map, and a list of directions. For this assignment, the driver and passenger happen to be a married couple. In this scenario, both the driver and passenger have defined roles. The driver interacts with the cars interface while the passenger interacts with the map interface. The contents of this system also include a list of directions to get to the destination. The following table outlines each artifact in the system and its corresponding role.

Table 2 — Distributed cognition model for navigation without GPS.

Artifact	Perception	Memory	Reasoning	Actions
Driver	Observes the vehicle interface and cars surroundings.	Remembers passengers' instructions.	Interacts with the passenger Interacts with the cars interface	Monitors for speed and direction. Reacts to the passengers' directions.
Passenger	Observes the surrounding for upcoming turns.	Remember the interpretation of the map. Remember what step in the list of directions they are on.	Interprets the map and list of directions Determines if an alternative route is needed because of traffic or road closures.	Knows the systems' current location using the map and surrounding signage and interprets the map to give the driver directions. Communicates information to the driver such that the driver can understand and react to the instructions.
Map	Distance to travel for each step	Visual depiction of the	Combined with the passenger, the map provides visual	Interacts with the passenger for visual representation of topography and infrastructure.

Artifact	Perception	Memory	Reasoning	Actions
		route and surroundings.	Representation of the path being followed during navigation	
List of Directions	Distance between each step of navigation.	Relieves the passenger of the need to memorize the list of directions to get from point A to point B	Combined with the map and the passenger, the map informs the passenger of steps to follow navigating.	Interacts with the passenger and the map to inform the passenger of instructions to turn, continue, and when they have arrived at their destination

3.2 Distributed Cognition Model of Navigating With GPS

Table 3 — Distributed cognition model for navigation with GPS

Artifact	Perception	Memory	Reasoning	Actions
Driver	Observes the vehicle interface and cars surroundings	Remembers GPS instruction of upcoming directions to turn, change lanes, avoid routes, etc.	Interacts with the vehicles interface. Interacts with the GPS – input of destination or point of interest.	Monitors surrounding, speed, and direction. Reacts to the GPS directions via a screen or audible instruction
GPS	Visual depiction of the map and surrounding area.	Long term memory – Visual display of all relevant information pertaining to routing.	Updates route resulting from accidents, traffic, road closures, etc.	Primary navigation system

3.3 Compare and Contrast – With and Without GPS

The system consisting of the driver, passenger, map, and directions is like the system with a driver and GPS in the sense that the cognition required to get from point A to point B is distributed across the components of each system and that each interface serves a cognitive role in the system.

The cognitive load of the driver in the system with only a GPS is higher though. This is because the driver must not only be aware of the vehicle interface like speed and other vehicles on the road, but also the GPS system. Although directions can be audible, it is often the case that the driver pays attention to the GPS screen to be aware of upcoming turns, impending traffic, or any other element that is not announced by the GPS. Contrarily, in the distributed cognition model made up of the driver and passenger, the drivers cognitive load is reduced because the passenger can more easily communicate what lies ahead understanding the driver's needs. Where the passenger with a map can adapt to the drivers needs by repeating directions or warning the driver of something the GPS would consider out of sequence, the GPS cannot. The GPS is programmed to perform a certain way in all conditions.

3.4 Social Cognition

The link between a social connection and distributed cognition to accomplish a task is at the heart of social cognition. In a navigation system consisting of a driver, passenger, and a map, social cognition is concerned with not only how the relationship between the passenger and driver combine to accomplish a task, but also how the relationship affects their behavior and opinions. In the system consisting of a GPS and a driver, the lack of social cognition is a disadvantage when unplanned actions need to take place. Things like stopping to eat or stopping to refuel/recharge a car are better supported by a social system. Moreover, the social relationship among the parts of the system can both positively and negatively affect the system. If the driver is distracted by some type of dialog with the passenger increasing the drivers cognitive load, the safety of the system is at risk. On the other hand, in a system with GPS, the drivers cognitive load can be reduced as the dialog in this system is done unidirectionally. As a result, the driver can be focused on their surroundings.

4 DISTRIBUTED COGNITON – EVERYDAY TASK

As stated in an earlier assignment, I am an avid coffee drinker. As such, I have 3 coffee machines in my kitchen. One is a standard drip coffee pot, one a Keurig, and the third a Nespresso machine. The Nespresso machine has the simplest interface of the three. The pieces of the system consist of the user interface, the machine itself, and the human user. To brew a pod of espresso or coffee, there is a lid that opens on the machine which reveals a basket where the pod is placed. There is a water tank used to supply water to the machine. Lastly, the user interface consists of start button which the user presses once the device is ready to brew and a lever to open and/or close the lid. To indicate the device is ready to brew, the button with an image of a coffee cup, seen in Figure 1 below, will be illuminated with a solid white light. The task of brewing coffee using this machine is one example of an everyday application that utilizes distributed cognition.

Figure 1—Nespresso coffee machine user interface. Source: Author

4.1 Cognitive Tasks

From the point of view of distributed cognition, each member of the system, or artifact, engages in a range of cognitive tasks. Each artifact, supported by the other artifacts, employs perception, reasoning, and action to complete its individual task. The cognitive task of each artifact is as follows:

4.1.1 *The Human User*

As the human user, I must ensure the system has enough water to complete the task of brewing coffee. Since each pod requires a different amount of water, I must employ reasoning to determine if more water is needed. Moreover, because I use many of the same pods, recalling the amount of water each one requires is done without reading the amount on pod itself. I can use memory to remember the brown espresso pod requires 2 ounces of water, the green and blue coffee pods require 8 ounces of water, etc. Concerning action, I am tasked with physically inserting the pod and interacting with the user interface by pressing the start button. If, for any reason, the machine cannot perform its task, I must perceive the state of the machine and any warnings the user interface notifies me of. To assist with this cognitive task, the user interface will use an orange light to notify me if an issue exists.

4.1.2 *The Nespresso Machine*

The Nespresso machine consists of the water tank, the user interface, and the mechanisms required to brew the coffee/espresso. Each pod has a barcode on it instructing the machine of what pod type was inserted. Because this is a non-human artifact, there is no reasoning done here. However, the machine does perceive the user's requirements and the state of the machine and adjusts its actions accordingly. This includes the amount of water, water temperature, and notifying the user if any issues exist that would prevent the artifact from completing its task. Concerning action, the machine combines hot water with the pod, spins the pod to extract the coffee/espresso liquid, and directs the liquid to a spout where there is a cup to receive it.

4.1.3 *The User Interface*

The user interface (UI) is where I, the user, initiate the start of the task. Once the pod is inserted and the lid is closed, the UI will blink white. The light continues to blink white until the system is in a state with which the task can start. By employing perception, the UI monitors the state of the machine for the correct water temperate, amount of water required, and any errors that it is notified of. If an error exists, the white light will convert to a solid orange light. Pertaining to action, once the device is ready to brew and the user presses the start button, the UI informs the machine that it should begin its corresponding task.