CS6750 Assignment P4 (Summer 2021)

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1 GOMS MODEL

First, the *initial situation* is that the student is needing to contact the professor requesting an explanation on the reasoning behind the grade received. Second, the *selection rules* can be established as follows: (1) If it is time-sensitive, then choose the "email" method. (2) If a regrade request is required, then choose the "Assignment Follow-Up Form" method. (3) If the communication is informal, then choose the "EdStem" method. (4) If facial expressions are required, then choose the "go in person" method. Third, based on the selection rules identified above, the following set of *methods* were generated that can be used to accomplish the task, each with the operators that comprise those methods and the estimated amount of time to execute:

1. Email
   a. Open email application (1 to 10 seconds)
   b. Select "compose new message" (1 to 2 seconds)
   c. Input "Title" and "To" fields (5 to 15 seconds)
   d. Compose the message (5 to 10 minutes)
   e. Send the email (5 to 10 seconds)
2. Assignment Follow-Up Form
   a. Locate the "CS6750 Assignment Follow-Up Form" (2 to 10 minutes)
   b. Locate your Canvas ID (1 to 3 minutes)
   c. Input your Canvas ID (5 to 10 seconds)
   d. Select the assignment in question (5 to 10 seconds)
   e. Select the description that matches the request (5 to 10 seconds)
   f. Submit the form (1 to 3 seconds)
3. EdStem
   a. Open a browser (1 to 5 seconds)
   b. Enter "https://edstem.org/" in the URL (1 to 3 seconds)
   c. Select "CS6750" under "Courses" (1 to 2 seconds)
   d. Click the "New Thread" button (1 to 2 seconds)
   e. Select "Assignments/Exam/Project" from the "Category" (2 to 5 seconds)

f. Compose the message (5 to 10 minutes)
g. Check the "Private" checkbox (1 to 2 seconds)
h. Click the "Post" button to post the message (1 to 2 seconds)

4. Go in person
   a. Look up professor's office location and hours (5 to 10 minutes)
   b. Schedule an office visit (5 to 30 minutes)
   c. Travel to Georgia Tech campus in Atlanta (30 minutes to 48 hours)
   d. Find the professor's office (10 to 30 minutes)
   e. Speak to the professor (10 to 15 minutes)

Now finally, we can identify the *ultimate goal* of the user as "professor receives the request for an explanation regarding the grade received". Below is a visualization schema of the GOMS model (Joyner, 2021f) above (*Figure 1*):

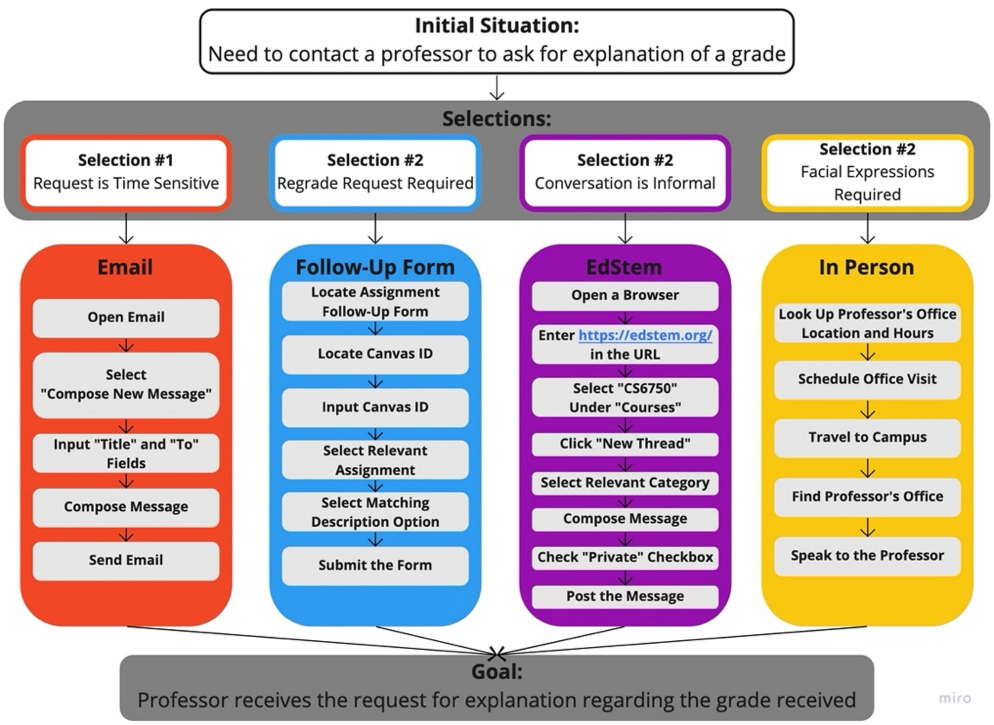

Figure 1— GOMS Model Visualization Schema

2 HIERARCHICAL TASK ANALYSIS

For the task of submitting this assignment (*Assignment P4*) to Canvas, and subsequently receiving one's grade and feedback, following *hierarchical task analyses* (Joyner, 2021i) are created as a plaintext outline format:

2.1 Submitting Assignment P4 to Canvas

1. Complete Assignment P4
    a. Read Assignment P4 instructions
        i. Open a browser.
        ii. Enter “http://omscs6750.gatech.edu/” in the URL.
        iii. Click “Current Semester” on top-right corner.
        iv. Click on “Assignment P4” under “Deliverable”.
        v. Read the full assignment instructions.
    b. View relevant lessons:
        i. Login to EdStem.
            1. Open a browser.
            2. Enter “https://edstem.org/” in the URL.
            3. Click the “LOGIN” button at top-right corner.
            4. Enter your Georgia Tech Email.
            5. Click the “Continue” button.
            6. Login using your “GT Account” and “Password”.
                a. Authenticate using “Duo Push” method.
        ii. Click on “CS6750” under “Courses”.
        iii. Click on “Lessons” icon at top-right corner.
        iv. View lesson “2.7: Task Analysis”.
        v. View lesson “2.8 Distributed Cognition”.
    c. Complete the response to the Assignment P4 questions.
        i. Obtain the JDF format document.
            1. Open a browser.
            2. Enter “http://omscs6750.gatech.edu/" in the URL.
            3. Click “Current Semester” on top-right corner.
            4. Scroll down to “Course Assessments” section.
            5. Find “Written Assignments” section.
            6. Click the “using JDF” hyperlink.
            7. Download the “JDF2.2-Starter.docx”.
        ii. Open the JDF template.
            1. Locate the downloaded “JDF2.2-Starter.docx” file.
            2. Double click to launch Microsoft Word.
        iii. Fill the JDF template with responses to Assignment P4.
    d. Review the document for correctness.

    i. Reopen Assignment P4 instructions.
        1. Open a browser.
        2. Enter "http://omscs6750.gatech.edu/" in the URL.
        3. Click "Current Semester" on top-right corner.
        4. Click on "Assignment P4" under "Deliverable".
    ii. Verify responses answer the questions in assignment.
        1. Read each question from the assignment prompt.
        2. Read the responses typed.
        3. Check that responses answer the questions.
e. Save the assignment.
    i. Click "File" at top-left corner.
    ii. Click "Save As" from the dropdown.
    iii. Type the file name in "Save As" field.
    iv. Select "PDF" from "File Format" dropdown.
    v. Click the "Save" button.
f. Submit to Canvas.
    i. Login to Canvas.
        1. Open a browser.
        2. Enter "https://gatech.instructure.com/" in the URL.
        3. Login using your "GT Account" and "Password".
            a. Authenticate using "Duo Push" method.
    ii. Click on "CS6750" under "Dashboard".
    iii. Locate Assignment P4 page.
        1. Click on "Assignments" on the left side bar.
        2. Click on "Assignment P4" under "Upcoming Assignments".
    iv. Submit the assignment.
        1. Click on "Start Assignment" button.
        2. Click on "Choose File" button.
        3. Locate and double click the saved PDF file.
        4. Check the "End-User License Agreement" checkbox.
        5. Click on "Submit Assignment" button.

2.2 Receiving One's Grade & Feedback

1. View grade and feedback once published.
    a. Check that Canvas notification settings are turned on.
        i. Login to Canvas.

        1. Open a browser.
        2. Enter “https://gatech.instructure.com/” in the URL.
        3. Login using your “GT Account” and “Password”.
            a. Authenticate using “Duo Push” method.
    ii. Verify notification settings.
        1. Open the notifications setting.
            a. Click “Account” on the sidebar.
            b. Click “Notifications” on the submenu.
        2. Ensure “Grading” email notifications are turned on.
        3. Ensure “Submission Comment” email notifications are turned on.
b. Wait for the email notification(s) to be received.
c. Click on the notification(s) once received.
d. Review the grade and feedback received.
    i. Login to Canvas.
        1. Open a browser.
        2. Enter “https://gatech.instructure.com/” in the URL.
        3. Login using your “GT Account” and “Password”.
            a. Authenticate using “Duo Push” method.
    ii. Click on “CS6750” under “Dashboard”.
    iii. Locate Assignment P4 grades and comments.
        1. Click on “Grades” on the left side bar.
        2. Find and click on “Assignment P4” under “Name”.
    iv. Review the grades and feedback.

3 DISTRIBUTED COGNITION COMPARISONS

3.1 Analyze the System from the Perspective of Distributed Cognition

The system of navigation before GPS was widespread was generally comprised of: (1) a driver, (2) a passenger, (3) a map, and optionally, (4) a list of directions generated via a website (i.e., MapQuest). Note that in this section, the driver and the passenger will be considered a married couple. Below is the individualized analysis of the system from the perspective of *distributed cognition* (Joyner, 2021j).

First, the driver performs the cognitive activities (Joyner, 2021h) of *perception* and *acting*. The driver utilizes their *auditory* perception (Joyner, 2021b) to hear the directions provided by the passenger. The driver utilizes their *visual* perception

(Joyner, 2021a) to match the current state of the system against the desired state, which is provided by the auditory directions from the passenger. The driver utilizes their *haptic* perception (Joyner, 2021c) to not only press on the brake or the pedal, but also gauge the rotation of the steering wheel and the driving assistance aspects such as turn signals. Lastly, the driver performs the cognitive activity of *acting* by essentially acting on the directions provided by the passenger. This is done in conjunction with the *perceptions* above to get the system to the desired state through the process of deliberation.

Second, the passenger performs the cognitive activities of *perception*, *memory*, and *reasoning*. The passenger utilizes their *visual* perception to read their current coordinates/location or to read the pre-generated list of directions. The passenger commits the next direction to their *working memory* to provide guidance to the driver verbally. If a series of short directional changes are required (i.e., taking multiple turns consecutively) the passenger may commit that information to their *short-term memory* (Joyner, 2021d) to provide guidance to the driver without having to reference the map or the list of directions. The passenger may have read the list of directions to identify important checkpoints (i.e., highway exits to take) in advance multiple times to commit the critical points to their long-term memory so that the system can meet its goal. Lastly, the passenger also utilizes *reasoning* as they might need to make sense of the next steps (i.e., number of miles before the next turn) given the current position. Additionally, the passenger might also already have some of the directions in their *long-term memory* from previous experiences, which they can relate to the driver for guidance without dependence on a map or a list of directions.

Third, the map performs the cognitive activity of *memory*. As a primary role, the map forms the system's *long-term memory* (Joyner, 2021e) that provides the different routes, streets, addresses, in addition to the origination and destination points that the passenger can reference to note the route to take and to determine approximately where they are at any given instance.

Fourth, the list of directions performs the cognitive activities of *memory* along with arguably some *reasoning* as well. First, the list of directions forms the *short-term memory* of the system that provides a quick reference to the passenger. Second, as the list of directions generally consists of the full list of directions from the origination to the destination, it also forms the system's *long-term memory* as an alternative to the map. And lastly, depending on the resources utilized to generate the list of directions, there can be some *reasoning* involved. The directions could have taken account for various traffic conditions based on the route and expected departure time inputted to the source, which could have performed the cognitive activity of *reasoning* to determine the best list of directions to take for the shortest path, reducing the cognitive load (Joyner, 2021k) of the passenger.

3.2 Analyze, Compare & Contrast Against Lone Driver Using GPS

In contrast to the system of navigation comprised of a married couple, a map, and a list of directions, in the system of a lone driver using a GPS, the GPS navigation is essentially performing the cognitive activities of the passenger, the map, and the list of directions outlined above. GPS navigation acts like both the *short-term* and *long-term* memory of the system that not only provides the exact routes to take using *auditory* means but also provides the exact location on the map, along with the planned and alternative routes that the driver can take. Additionally, it also performs *reasoning* by dictating the fastest route to take, but also where various road conditions, hazards, or traffic might be located. Now, there are some main notable differences in terms of social components that are present with a human navigator but absent with a GPS navigator. For one, the GPS navigator can only provide *auditory* cues based on what it already knows. For example, if there was a sudden accident directly in front of the driver, or if road closures unknown to the GPS were to be in the route presented, the GPS navigator would be oblivious to it, whereas the human navigator would be able to alert the driver using their *visual* perception as a second set of eyes. Also, the passenger can deliver a set of directions with a dynamically differing level of urgency, while the GPS navigator is confined by the predetermined settings. For example, a GPS navigator might say "turn left in 200 feet", while the human navigator might provide directions with a fluctuating auditory level such as yelling "turn left now!" or "remember to turn right at the next light, ok?" that creates a two-way communication feedback loop with the driver. Noting that, the presence of social relationships in the *social* portion of *distributed cognition* (Joyner, 2021l & 2021m) among the parts of the navigation system can greatly impact the success of the system as a whole. This is because the human navigator can provide a diverse set of directions and warnings, in addition to requesting verbal feedback for comprehension by the driver, while current GPS navigation generally is confined by preset settings in a one-way communication format.

4 DISTRIBUTED COGNITION - TASK ANALYSIS

One of the tasks that were described in a previous assignment is mowing the lawn using a manual mower (*Assignment P2*). The task involves an interface of a manual lawn mower that consists of the following pieces of the system: (1) the blades that rotate, (2) a set of wheels that are attached to the blades, (3) the height control lever, and lastly (4) the user that propels the mower forward.

First, the blades perform the cognitive activity of *acting*. While the blades themselves don't have any *memory* of how short the grass is being cut, or even *perception* on whether a particular patch of grass is cut at all, in the entire system the main purpose is to *act* on the patch of grass by cutting it as it moves over it.

Second, the set of wheels also simply perform the cognitive activity of *acting*. As the propelling force is exerted by the user, the wheels *act* on the user's exerted force by gliding across the direction in which it is being pushed to.

Third, the height control lever arguably performs the cognitive activity of *reasoning*. Based on the preset height levels provided in the lever, it provides the *reasoning* of how short or tall the grass should be cut to the entire system. This is particularly evident if you were to consider a truly manual grass cutting of using a scythe, where the user themselves must *reason* how short to cut the grass at each stroke. In essence, this extrapolates that cognitive task away from the user.

Fourth, the user performs many of the cognitive activities of *perception*, *reasoning*, and *acting*. When the mower is being pushed in a certain direction, the user utilizes *visual* perception to identify which section of the lawn has not been cut yet. When the user pushes the mower, they utilize *haptic* perception to determine whether a foreign object got stuck in the mower, as it will prevent the mower from being pushed until the foreign object is dislodged. In terms of *reasoning*, the user may perform *reasoning* based on which path provides the quickest time to complete the task (e.g., horizontal direction vs. vertical direction), in addition to performing *reasoning* to determine how much force to exert to cut a particular path of grass, based on its height. And lastly, in terms of *acting*, the user is the source from which the propelling force is derived from. The user *acts* on the mower to propel the mower forward, and towards the direction that they determined as providing the quickest task completion through deliberative *reasoning* above.

5 REFERENCES

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