CSE 440 2.h - Final Report
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DisTrack

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Problem & Solution Overview

Maintaining focus during a work or study session is extremely important for a student's academic success and productivity. Student's today are barraged with an increasing number of distractions that disrupt focus. DisTrack helps students manage these distractions and stay focused. By recording aspects of a student's behavior and their environment while they study, DisTrack enables a student to reflect on their study habits and performance and to see trends in overall distraction and focus. DisTrack recommends strategies and tools to reduce distractions and maintain focus that are catered to a student's distraction triggers and scores. These tools and recommendations can be acted upon when a user engages study mode. By providing a platform for reflection and tools and strategies for improvement, DisTrack helps students be more effective at studying.

Contextual Inquiry Target, Stakeholders, and Participants

We conducted a number of inquiries as we explored our problem space. Our inquiries can be broken up into three phases: The first phase involved observing individuals as they worked (without informing them beforehand) and then interviewing them afterwards. Inquiries in the second phase just consisted of the interview. Our inquiries in the third phase were focused on students working in groups. We focused our inquiries on students at the UW and used different on-campus and off-campus locations to observe students in different environments.

We conducted the first batch of inquiries in this format in attempt to reduce any bias we could introduce into the inquiry process. Ironically this strategy backfired in several cases. Three out of five individuals observed were significantly distracted by our observations and could not be interviewed. One of our participants, Johnson, is a 20-year-old full time computer science undergraduate who also has a part time job. We observed him for 30 minutes in CSE lab 006. Our interview with Johnson showed that his perception of how frequently he was distracted fell short of what we observed. He recalled using social media once but was observed using it four times. He also got very distracted by people talking with him near the end of our observation period and was aware of this happening. Johnson told us that he worked in the CSE labs because he had made the space "his office" and thus had a much easier time focusing there than at home.

We changed our format to interview-only in our second batch of inquiries because of the bias we introduced and because we had observed several common trends already. During this phase we interviewed two participants, George and Steve, both of which were 25 year old, full-time graduate students. George was studying in Odegaard library and Steve in a dorm common area. Steve mentioned that he was motivated by other students studying and chose to be in busy environments for that reason. Interestingly, he also said he was most distracted by people around him and social media. Steve and George both mentioned the importance of taking breaks while studying. George also told us that he turned off notifications from Facebook

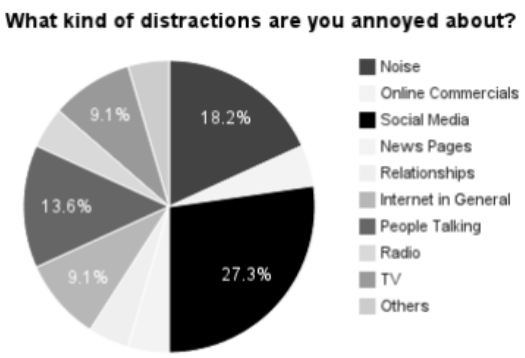
on his phone to stay more focused.

We chose to focus on group work for our third batch of inquiries because this is a common situation for students at our university. We conducted a total of three inquiries in this batch. One inquiry was done on a group of four undergraduate students studying at Yunnie Bubble Tea on the Ave. We chose this group because they were working off campus and the students were of different majors. This group was interesting because three of the students were mainly there to socialize, and were their on most significant source of distraction. The other student used headphones to be in her own space, and was mostly distracted by social media and other things on her computer.

Contextual Inquiry Results and Themes

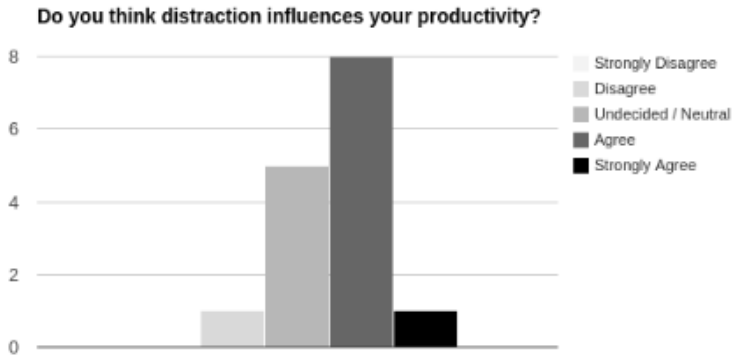
We supplemented our contextual inquiries with an online survey that had 16 participants. We found through our inquiries and survey that the most significant sources of distraction for individuals were social media, digital communication, noise (in general), people talking to them, and the behavior of people nearby. Refer to graphs 1 and 2 for results of our survey. We also discovered that people don't necessarily intend to be productive when studying in groups, and also that the dynamic for a productive group differs significantly from that of a productive individual. These factors increased the complexity of a solution catered towards groups significantly and for that reason we chose to focus most of our analysis on the problems faced by student's studying individually rather than in groups.

The most significant distractions that student's faced while studying were generally as we expected. Social media and digital communication such as emails and text messages are very significant sources of distraction. What was interesting to discover was that student's perceptions of their distractions by these digital sources were largely incorrect. Students were distracted more than they thought. Most students were also unaware that notifications from messages and emails could be disabled with most devices and services. Students were also significantly distracted by environmental noise and busyness as well as people talking to them. Students currently try to mitigate these factors by choosing ideal locations to work in and by using headphones while studying.



Graph 1

Our inquiries also showed that some students are aware of the limits of their own focus. Some of these students worked in locations where they would be surrounded by other working people to get more motivation. Others would try to take periodic breaks. We found the breaks particularly interesting since research supports that people cannot concentrate effectively for long intervals. Those students who did try to take breaks mentioned that they forgot to do so frequently enough to be optimal.



Graph 2

The results of our inquiries and survey suggested a number of opportunities for our design. A mismatch in perception and reality of distractions means that a tool that could report accurate data on what occurs during a study session would be useful. Student ignorance of distraction reducing tools and features such as suppressing notifications or using website blockers suggests that it would be useful to have a tool that would educate students about tools and strategies to be less distracted. Our results also show that students sometimes need help with motivation and could could benefit from break reminders during their study sessions to be optimally productive. We used these results as the basis for our system's design.

Task Analysis

Who will use this design?

Our target audience is college students, specifically UW students, who find themselves distracted too much and wish to increase their focus and productivity. We are targeting undergraduate and graduate students with an expected age range from 17 - 30. While students study alone and in groups, our design is focused on helping students who study alone.

What tasks do they now perform?

During their work sessions :

- Students use headphones to minimize noise and/or listen to music to stay focused.
- Students disable notifications or turn off their phones or computers.
- Students pick locations that they think they will be less distracted in.
- Students check notifications at self-imposed intervals as opposed to constantly checking devices.
- Students take breaks when they feel unproductive so they can be more focused/motivated at a later time.

What tasks are desired?

The students in our contextual inquiries want to increase their productivity by avoiding distraction. However, in order to accomplish this goal, students need to know what distracts them, how often they become distracted, and/or how being distracted affects their productivity. Most students felt they would be motivated by being able to see their past performance and their trending improvements in productivity. On top of such reviews of their performance, students also want feedback and recommendations: they want to be alerted when they spend too much time with an activity not related to their work; they want to know what tools / methods exist for reducing distraction (e.g. filtering notifications to present in batches at intervals), and they want to ascertain which study locations correlate with their most productive work sessions. During long work sessions, many would like to be reminded to take breaks periodically, thus giving them better focus when on-task.

From our contextual inquiries, we decided on six, vital tasks:

1) Setting up and continuing a concentrated solo study session.
2) Recording ‘digital’ & ‘non-digital’ behavior while working.
3) Reflecting on overall distraction based on time and locations.
4) Prompting users to take breaks between work sessions.
5) Finding the most productive environments to study or work.
6) Finding and implementing methods and strategies to reduce distractions and increase focus.

How are the tasks learned?

Many students already follow some basic steps for staying focused, like using headphones and picking a suitable study location. Learning to use the active features of our system will build upon these habits. For example, first-time users will be able to tell the system where their favorite study spots are, and the system in turn can notify them when they visit those locations in order to activate work mode. In this way, the system and the user inform each other. Another interaction loop occurs when a user sees recommendations for new study habits and productivity tools that are related to the data tracked during their study sessions..

Where are the tasks performed?

Students engage in the above tasks wherever they choose to work. These locations may represent a wide variety of environmental conditions, ranging from quiet libraries to noisy cafés, from locations mostly occupied by friends and peers to places with a more diffuse demographic, or from private spaces to spots that support group studying.

What is the relationship between the person and data?

College students are accustomed to being surrounded by number of electronic devicesn. Because of this, , data on personal distraction can be collected from multiple sources, both digital and non-digital, in order to build a comprehensive picture of a student’s overall work habits. The user will also interact with the data in two temporal modalities: in real-time (to see their immediate productivity level) and in retrospect (to reflect on their past performance). The personal nature of the data the system collects necessitates its secure storage and transmission so that only the authorized user can access it.

What other tools does the person have?

Currently students have access to a variety of time-tracking software like RescueTime and Time Doctor. These applications track and record the total amount of time users spend on digital applications and websites and report the data in various graphical formats. Plugins for blocking user-specified websites are also available on some desktop web browsers. Additionally, many devices already offer notification batching, but most of our contextual inquiry participants were not aware of this functionality. This is a teaching opportunity for our system to bring some of these tools to light based on a user's productivity history.

How do people communicate with each other?

According to our inquiried participants, they are not interested in sharing their tracked distraction data with other people. Additionally, conversation with other people was one of the major distractions we recorded during our group study observation sessions. As a result of these observations, our design will concentrate on private distraction tracking without communication features since there was no real benefit of such features according to our contextual inquiries.

How often are the tasks performed?

The main feature of our design, generating reports of the user productivity, is done in real-time (i.e. continuously performed) so that the users will always get updated data. However, some tasks are executed exclusively when students start their work sessions and thus depend on how often the students study. For instance, the recording task can only be done when students are studying or doing homework; the break reminders task is also only useful when students are in need of a break during a study session. Meanwhile, students could choose any time to reflect on their performance history and look for new ways to become more productive.

What are the time constraints on the tasks?

To successfully generate meaningful patterns and recommendations from the data, users may have to track their activities for a certain amount of time before the system is able to summarize and predict distractions. The longer the system tracks the user, the more predictive power the system will have due to the larger test data set. Nonetheless, certain tasks can be engaged immediately, regardless of the amount of tracked data, since the user can manually select distraction-reducing tools from the get-go based on their past experience.

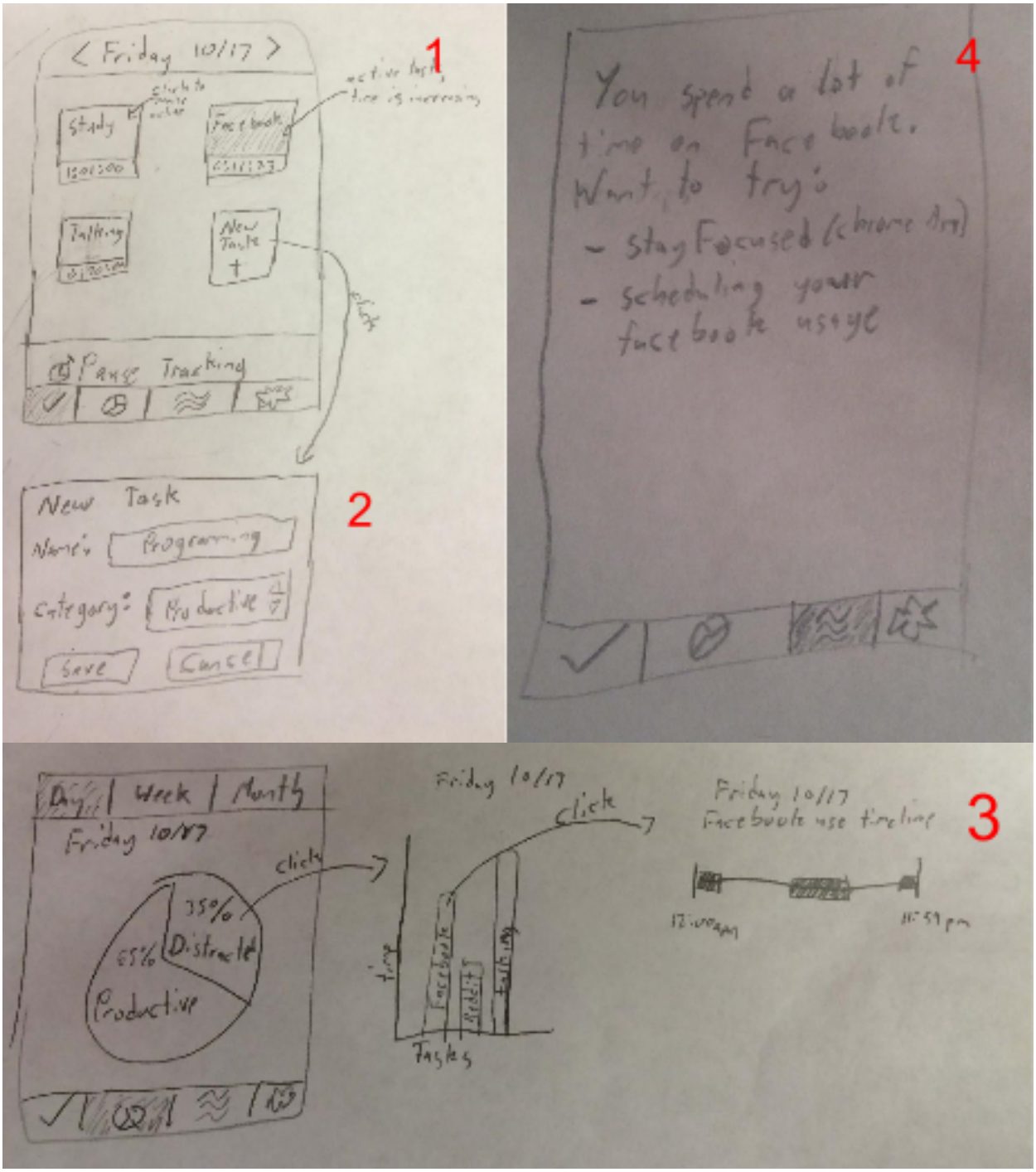
What happens when things go wrong?

If the system incorrectly classifies an activity as productive or distracting, a user can fix the problem by manually correcting the mistake through their user dashboard. However, this can only occur if the user catches the error themselves during reflection: small misclassification time-intervals are likely to go unnoticed. In this case, when the tracking tasks go awry, the users will receive incorrect feedback and lose opportunities to improve upon their performance. Fortunately, since such cases have smaller time granularities, they are unlikely to sway the overall trends drawn by the system.

Proposed Design Sketches

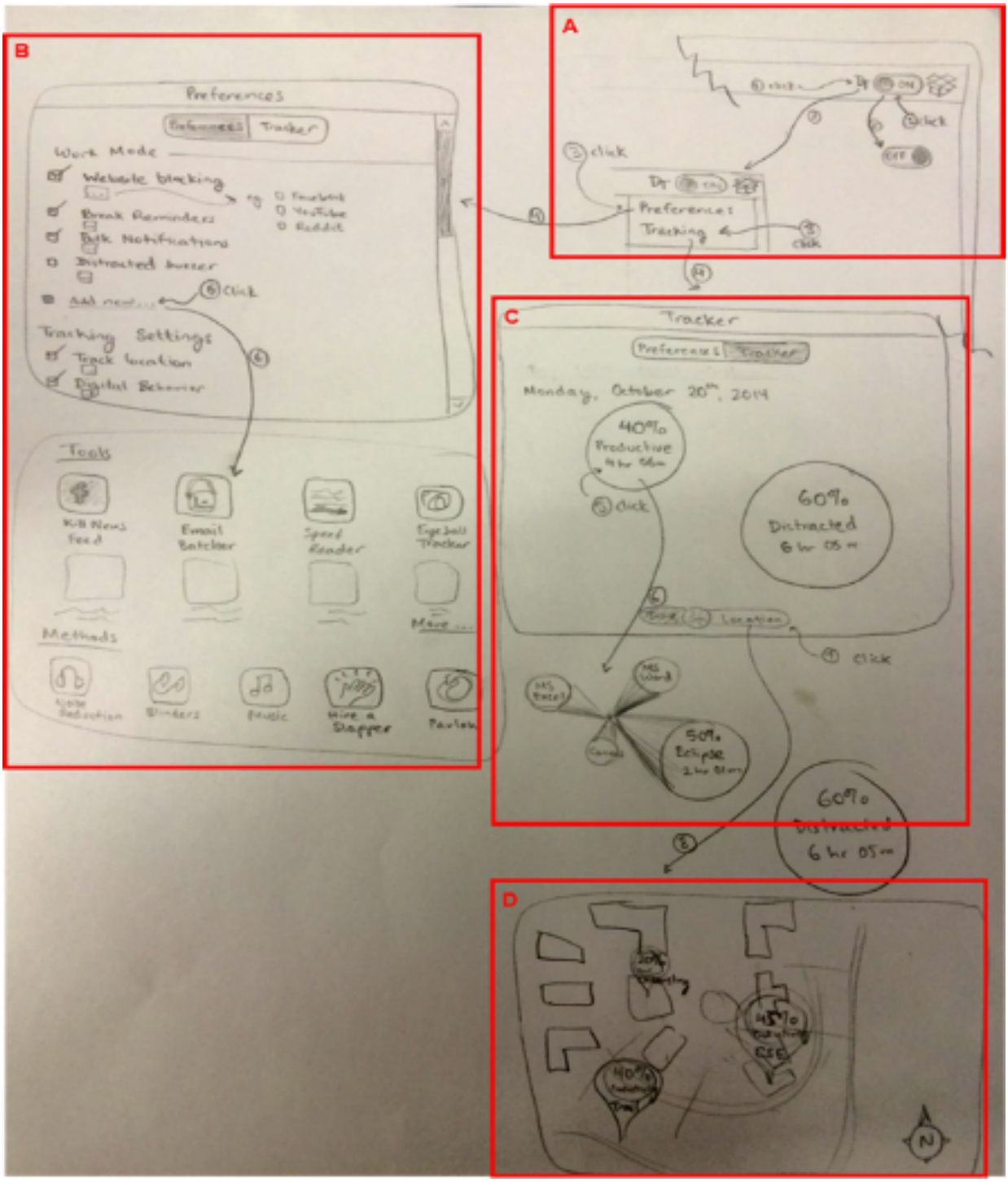
Design 1 - Mobile Phone with Manual Tracking

This design proposal is centered on a mobile phone application that tracks distraction sources and productivity levels. In this design, the user manually informs the system of the actions they are currently doing, and the system records the amount of time spent per action. Examples of actions include studying, talking with friends, and browsing Facebook (fig. 1). Actions are created by the user and are assigned a category of productive or distracted (fig. 2). Users can see overall scores of their productivity, a breakdown of time spent on each action per productivity category, and a timeline of when they spent time doing an action (fig. 3). Based upon the data collected, the application can provide recommendations for methods and tools that the user can use to reduce distractions (fig. 5).



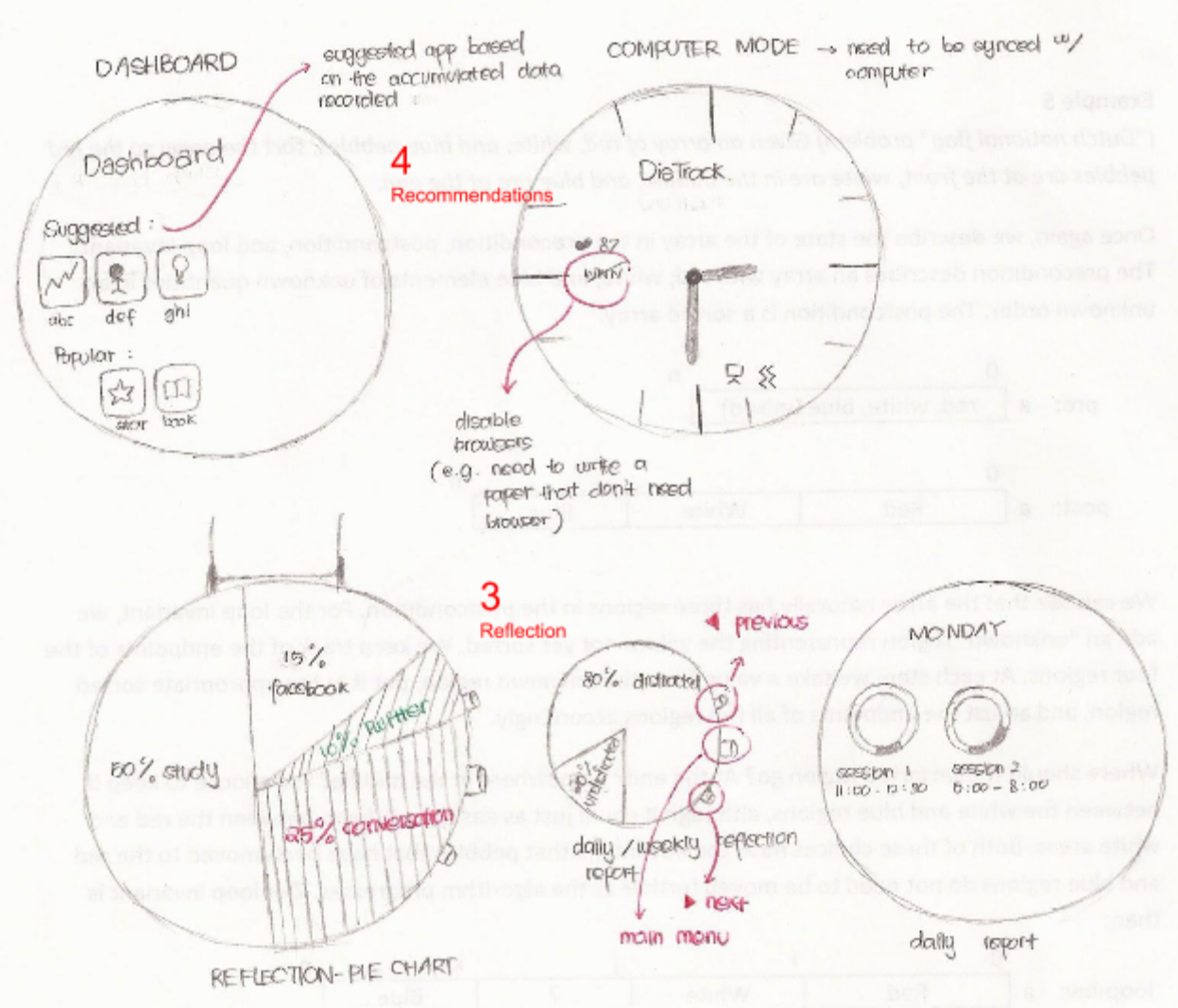
Design 2 - Desktop Application with Automatic Tracking

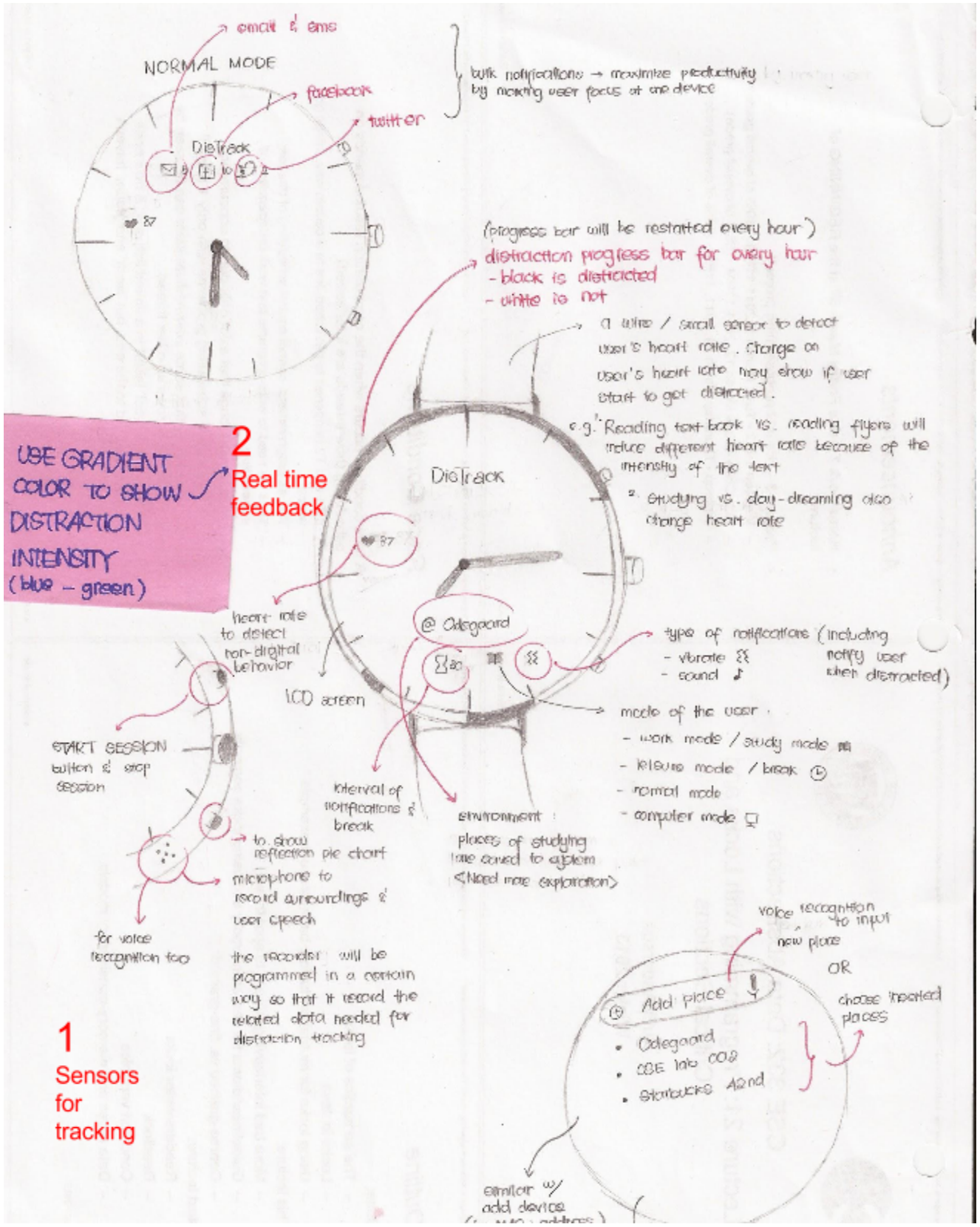
This design is centered around a desktop based application that automatically tracks digital distractions. A user of this design can start a work session by toggling a ‘focus mode’ on or off through a taskbar widget (fig A). When the focus mode is turned on, the tracking of digital and non-digital behaviors begins and stops when focus mode is turned off again. The system tracks digital behaviors directly by recording the active applications and windows on the user’s desktop and, if paired with the system, mobile devices. Location is also tracked using WIFI and GPS (if a mobile phone is paired). This recorded data can be reviewed at different time scales in the form of bubble charts and maps. This lets users see their overall productivity level as well as their time spent on each task while working (fig C). It also enables a user to see their productivity relative to the location they worked in (fig D). Finally, the system provides recommendations and tools for decreasing the user’s distractions. Examples of these recommendations include website blockers, notification suppression, and break reminders (fig B).



Design 3 - Wearable Tracker

This design is centered on a smart watch. This form factor is better suited for tracking non-digital behaviors and the user's environment and for displaying real time notifications and feedback. Using multiple embedded sensors such as a microphone, accelerometer, and GPS (fig 1), the watch can track general noise level, conversations, and the user's movements and location. During tracking mode the minute hand draws either a light or dark colored line along its path on the rim to show the user in real time whether they are being productive or not (fig 2). In reflection mode, the watch displays the activities tracked in a pie chart (fig 3). This shows exactly how much time was spent on each activity. Based upon the data tracked, the watch can give recommendations for reducing distraction and enable features that will help the user stay focused during their next study session (fig 4).




email & sms
NORMAL MODE
facebook
twitter
DisTrack
bulk notifications → maximize productivity by making user focus at one device
(progress bar will be restarted every hour)
distraction progress bar for every hour
- black is distracted
- white is not
a wire / small sensor to detect user's heart rate. Change on user's heart rate may show if user start to get distracted.
e.g. Reading text book vs. reading flyers will induce different heart rate because of the intensity of the text
Studying vs. day-dreaming also change heart rate
USE GRADIENT COLOR TO SHOW DISTRACTION INTENSITY (blue – green)
2
Real time feedback
DisTrack
87
@ Odegaard
LCD screen
heart rate to detect non-digital behavior
type of notifications (including notify user when distracted)
- vibrate
- sound
mode of the user :
- work mode / study mode
- leisure mode / break
- normal mode
- computer mode
START SESSION button & stop session
interval of notifications & break
environment :
places of studying late saved to system
<Need more exploration>
to show reflection pie chart
microphone to record surroundings & user speech
for voice recognition too
the recorder will be programmed in a certain way so that it record the related data needed for distraction tracking
1
Sensors for tracking
voice recognition to input new place
OR
choose inputed places
Add place
Odegaard
CSE lab 002
Starbucks Agnd
similar w/ add device

Final Design - Cross Platform Device

We decided that the best design was a combination of two of our earlier sketches. We combined the desktop application with the smartwatch. The desktop's form has the advantage of being a common tool used by students. It has a large screen which makes it ideal for displaying full reports on data recorded during study sessions. The smartwatch is better for real-time notifications and feedback while the user is studying. It also has the advantage of being accessible to students even when they are not using a laptop to study. Part of our motivation for choosing the watch came from one of our inquiry participants, George: *"it - our design solution - needs to be right in your face, so that you are reminded of your work and stay focused"*. We felt this design addressed our core tasks, (1) Reflection on digital/non-digital behavior and (2) finding and implementing methods and strategies to reduce distractions and increase focus, in a very effective way. The first task is addressed better by the desktop application, while the second task, specifically the implementing methods portion, is addressed better by the watch. We think this design does the best job at creating a feedback loop for the user so that they can improve their habits over time.

Scenarios

Tracking and reflecting on behaviors during work session

George, an undergraduate UW student, is using the DisTrack system to understand how productive he is during his work sessions. The system pairs his computer with his smart watch. When George starts working he clicks the icon in his menu bar and sees the following options: Begin Tracking; Focus Mode; Reflection. Since George is starting to work he clicks on "Begin Tracking" and starts working on his paper. While he works he notices the minute hand of his watch leaving a green trail around its rim. George occasionally switches between his work and browsing the news feed on Facebook. He realizes the trail left by the minute hand turns from green to red when he switches to Facebook. The pattern created on the rim visualizes the productive and distracted periods of his work session in real time. A few hours later, George finishes his paper and stops tracking his work session. He enters the reflection view on his computer and sees that he actually spent most of his time on Facebook rather than working (refer to storyboard 1 for an example of this reflection). George thinks he should improve on his productivity by being less distracted by social networks.

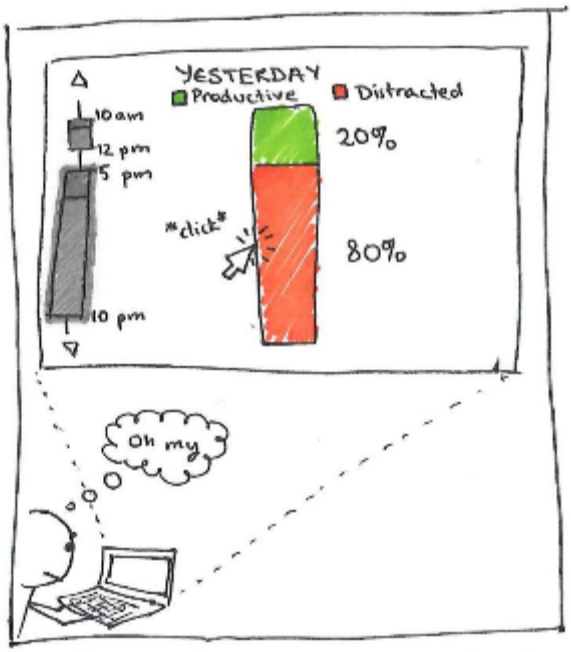
Finding and implementing strategies to stay focused

After learning that he is very distracted by social networks, George discovers a couple of methods recommended by the DisTrack system to combat such distractions. The system suggests to send him an alert the next time he stays on Facebook for too long. George agrees and turns on the "Distraction Alert" option in the focus mode preference pane. The next day, he turns on the focus mode on his computer before starting his work session. As usual, George occasionally switches between his work and Facebook throughout the session. However when he spends too much time reading the Facebook news feed, he receives a vibration along a visual alert on his watch telling him that he has been distracted from work for too long (refer to storyboard 2 for another distraction reminder in action). George decides to stay away from social networks for couple of hours and finishes his assignment in a much shorter time than usual.

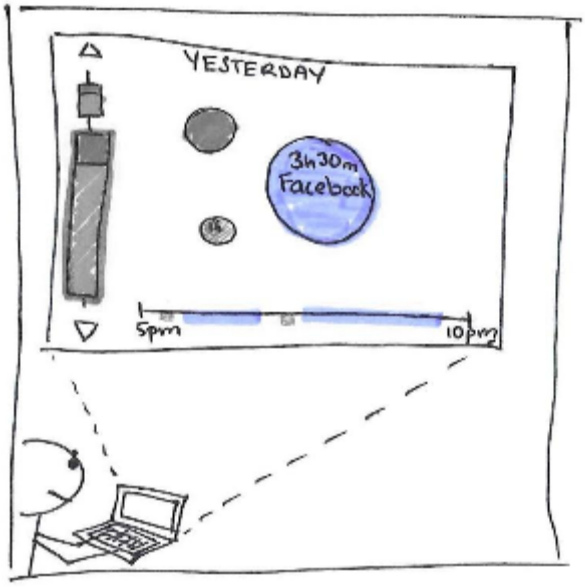
Storyboard 1:

Reflecting on digital & non-digital behavior in a study session

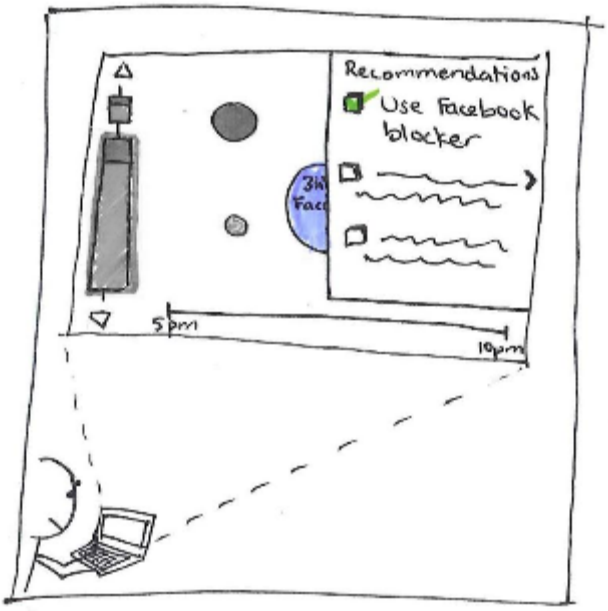
1) George receives an F on his math test, but remembers studying for 5 hours yesterday.



2) George looks at yesterday's data and sees that he was unproductive.



3) George sees that he spent most of his study time on Facebook.



4) George decides to use a Facebook blocker next time he studies.

Storyboard 2:

Implementing methods and strategies to reduce distractions and maintain focus