The Effect of Excess Idle Time

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INTRODUCTION

Understanding the effect of excess idle time on the environment is just as important as understanding user habits with idle time accumulation to reduce the amount of waste in the future. Many users are unaware of how the amount of idle time they accumulate can contribute to the ecological footprint that they have on the environment. By reducing the amount of time a user allows his/her computer to become idle, performing no useful tasks, they cannot only save money, but save a part of the environment.

To accomplish this, it is key to study user habits with power usage settings on personal machines, the amount of time spent on the machine, how much of that time is spent performing useful tasks, why a user chooses to leave their personal machine, what that machine is doing at the times that it is not in use but on, and whether a user finds energy saving practices to be useful or inconvenient. By studying the averages of these patterns, we can determine how to best suggest behavioral changes, and whether those changes produce a positive effect in reducing a single user's ecological footprint.

METHODOLOGY

For phase one of this study, we chose to start with a pool of participants whose primary computer was a laptop. This pool had a cap at forty, and the duration of the study was two weeks. After the completion of the laptop users study, we came to the conclusion that desktop users would benefit more from the feedback section (phase two). Thus, we included a phase one portion of just desktop users. The cap on this group was ten, and the duration was also at two weeks.

From this pool of fifty total users, we selected fifteen participants at random to be a part of an additional interview at the end of the study. This interview would consist of follow-up questions based on the individual data collected from the two weeks of phase one. These interviews served to help gain a better understanding of specific patterns or quirks. The point was to be able to make an accurate analysis and feedback suggestions for those participants who would participate in phase two of the study.

Each of these participants in phase one were required to fill out a general survey on day one, which asked questions about general machine use and recycling habits. Then, each day following, the participants were required to fill out a short survey asking what their power setting for their machine were that current day, what they believed they were doing at any point they may have become idle that day, and what their machine was doing while they believed themselves to be idle. These questions helped us understand if the participants were paying attention to when they were going idle, and what they could possibly be doing or what their machine was doing, while they were away. The patterns that formed from this information would help us determine if we needed to suggest an alternate action (i.e. turning the machine off while they were away, downloading at a different time of day, etc.), or if their computer was still performing useful tasks while idle.

On the very last day of the study, each participant had to complete what was known as a "bot diary". The AOL Instant Messenger (AIM) chat bot that we had implemented to monitor each participants status changes would send a participant an instant message (IM) whenever that participant became unidle. This IM would ask the participant what they had just been doing, and what their machine had been doing during that time. Their response would also be via IM back to the bot, which the bot would record to a log along with the status changes information.

Our AIM chat bot was developed from the AIM SDK on the AIM developer website. We made the necessary changes to have the bot recognize each of the various status changes for a user and to record status change dates, times, and user ids to a separate log file. The bot also recorded to the log any IMs sent to it. This information helped us determine the habits for a particular user (i.e. how much time they spent online, how much of that time was actually spent at the computer, etc.).

Naturally, there were several participants who did not complete the study, but we were still able to determine several useful patterns for generating suggestions. The process that I used for generating suggestions was to analyze the general data from the general surveys and any strong patterns from the daily surveys and the log data. Once I had grouped participants into different situations (i.e. users who are always online, users who turn off their computer each time they are not using it, etc.), I began to write sample suggestions, and determined what percentage of the users in that particular

group would be effected by that particular suggestion. From these sample suggestions, and the finding out the process for analysis, we would be able to create feedback suggestions for phase two easily.

CONCLUSION AND FUTURE WORK

Our findings from the general survey for phase one were that most users used AC power for their laptops rather that relying on battery. About half of these users were already using the standby/sleep mode on their computer, whether it was set-up automatically or performed manually. The biggest motivation for saving energy was money, followed by altruism. Our findings from the daily surveys and the logs showed that most idle time periods were short, the user performing tasks such as eating, using the phone, etc. The average user believes that by turning their computer off that they are extending the life of the machine. On the other hand, the average user also prefers to leave their computer on for easy access. The average user finds the time to boot a computer or bring it back from standby/sleep to be highly inconvenient. Most users run a screen saver automatically, but only about half run antivirus software.

From these findings, we determined the most important patterns to create feedback suggestions for phase two of the study. This phase will consist of a one to two week period in which the participants are monitored not only using the AIM chat bot, but also using a CPU process sensor that logs to a database. This CPU sensor needed to be installed on each participant's computer, and was tested during phase one of the study primarily on the desktop users.

After this baseline period, the participants for phase two would be separated into three groups. Each of these participants had a feedback window displayed on their computer showing them the amount of idle time they had accumulated and how much it was costing them in dollars. In addition to this, the first group would receive no feedback suggestions. The second group would receive feedback suggestions chosen at random from a pool of generic suggestions. The last group would receive more personal feedback suggestions depending on what programs they were running while idle, what time of day they were idle, and the last time that suggestion was last displayed. These suggestions would be shown every time a participant came back from idle.

The results of these findings will show us how effective these feedback devices are in changing the behaviors of the average user in an attempt to educate them in how to reduce their ecological footprint by simply cutting down their idle time.

RELATED WORK

I studied some of Jacob Lorch's work, including his doctorate thesis, finding his work similar to our study. While our study concentrates on the input of select participants, and their idle usage habits, Lorch address the issue of energy consumption from the hardware aspect. In his studies, he also used some user input to determine settings and effectiveness of energy saving features (i.e. "sleep mode", etc.), but that wasn't his main focus. The focus was to make the hardware more efficient, dependent of having to educate a user to change their behavior. Our research takes that further step to educate the user and achieve the full benefit of energy saving practices. Optimizing the hardware can only go so far as long as the user is given control of the machine. If the machine were to function on fully automatic processes, it could achieve the maximum energy saving capacity on its own. Both approaches are necessary to reduce that amount of energy used, or wasted, by a machine, so both approaches are relevant.

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