Gas Station Payment Interface Redesign

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Abstract— **Refueling our automobile is a task most of us need to perform on a near weekly basis. Although this event occurs much less frequently than teeth brushing (hopefully daily), and only takes a few minutes, the thought of "getting gas" still triggers a negative cognitive response in the user's brain.**

I. HEURISTIC EVALUATION

The task of refueling your automobile is unavoidable by users of automobiles. A survey of users from ages 21 and above shows that 85% of users refuel their automobile once a week or twice a week, yet we see that almost all users would like the process to be more efficient and take less time. Although the existing gas station payment interface utilizes many great design principles, such as consistency, discoverability, and constraints, to create a system that works well and delivers a positive user experience, there are many lacking aspects that cause the system to not work well. The existing interface misses key principles of design such as perceptibility, flexibility, equity, and ease.

Consistency is the key principle and the reason primarily why the existing payment interface works well and has yet to be entirely overhauled. All payment interfaces for all gas stations in America follow the same conventions, hence all interfaces exhibit the design principle of consistency. This allows users who have successfully operated any interface, to be able to successfully operate any other interface. This is a strength of having a consistent user interface. Despite the different vendors, users are able to use the same conceptual model to operate the interface in any gas station. The LCD screen and options displayed on the screen give users an immediate sense of the options available to them. In this sense, the existing interface utilizes the discoverability principle very well. The actions possible are clearly stated on the screen, usually paying with credit or debit. This immediately provides users with a clear understanding that payment comes first and they have two options to pay with. The constraints of the system works closely with its discoverability. The user is constrained by the options on the screen and the buttons on next to it. This physical constraint makes the choice easy for the user. Either the user is able to pay with card and initiate the card payment process, or the user is unable to pay with card and needs to enter the store. Although the existing interface works well by following these principles, using these principles and not making any changes has also been why the system is no longer working as well as it could be.

Due to globalization and the rapid growth of technology, the lack of innovation in the gas station payment interface is now leading to poor user experiences. Take for example a user who just arrived in America from a different country and does not read English. The existing interface we have would be a nightmare in terms of its learning curve for the user. Users would not have any idea whether to choose credit or debit, and in most cases, would probably be paying with cash anyway. This issue was not prevalent in the past due to the lack of international traveling, but is noticeable now. Although feedback cycles allow the user to perceive the current state of the system, the delay in returning the feedback is many times longer than a common feedback response of today, for example loading a webpage. This can cause timing issues with executing actions in the interface, creating longer than necessary gulfs of execution and evaluation.

Perceptibility is a key principle that is not present in the existing interface, causing the existing payment interface to not work well. The lack of feedback mentioned above is a prime example of why perceptibility is poorly utilized; feedback isn't returned quickly enough, causing unnecessary pauses in the gulf of execution due to wide gulfs of evaluation. Flexibility and equity is nonexistent in the interface. The existing design is only for users who have experience with the interface and for English reading users. Someone from a different country would struggle with our current system. As America is a great melting pot of people from around the world, this is becoming a bigger and

bigger issue. The current design is not made for both experienced and inexperienced users; not all users receive the same user experience either. The ease of use aspect is also lacking as there are only two ways to pay using the existing interface. The interface should account for all common forms of payment, not just by card. All of these issues are why more than 70% of users believe there is a need to improve the user experience at gas stations and why users want to reduce the amount of time spent at gas stations.

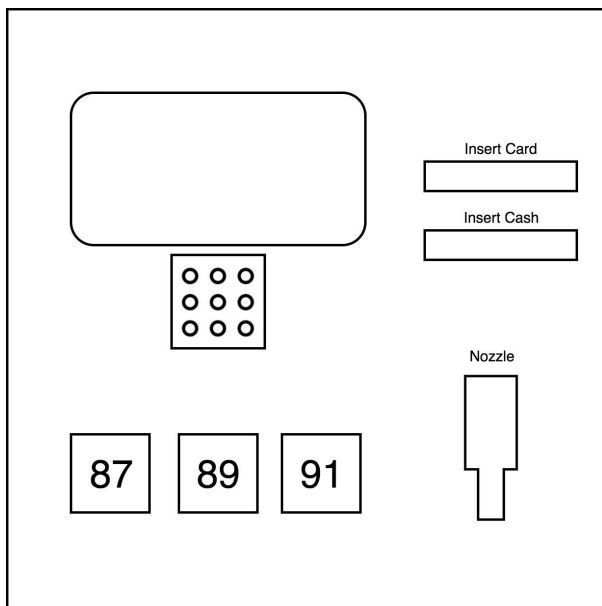II. Interface Redesign: Diagrammatic

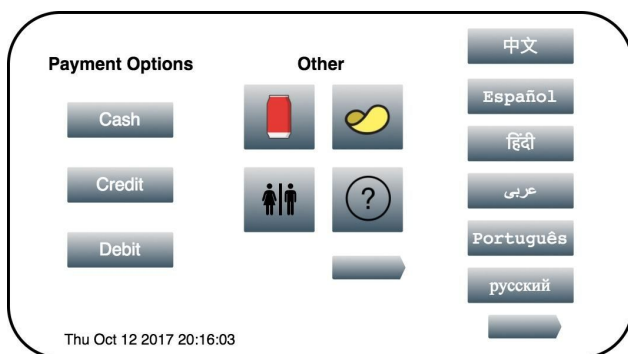

Figure 1. Redesign of hardware

Figure 2. Redesign of start screen
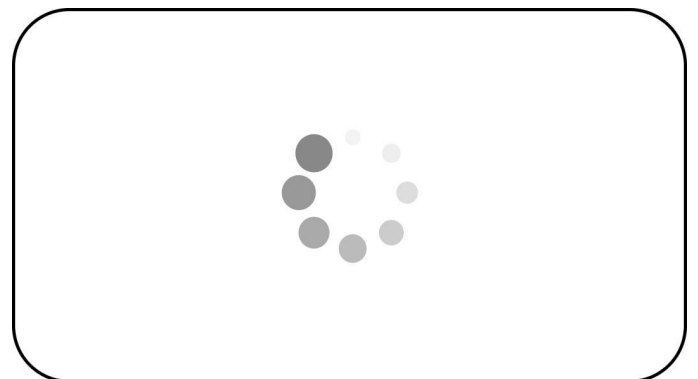

Figure 3. Select language screen

Figure 4. Redesign of loading screen

III. Interface Justification

The redesign of the hardware only consists of adding an additional vehicle for accepting payment, accepting cash payments. Most self service payment systems have an area for inserting cash as a form of payment. A new payment system should at a minimum, support cash payments as well as card payments. This expands the usability of the interface to people who want to pay with cash. From surveying users of the interface, about half of the users pay with cash and need to leave the station and enter the store to provide payment, hence it is imperative that these systems start accepting cash in order to improve the efficiency of the process. The only other major change is increasing the size of the display and making it touch screen. This allows for better readability and incorporates direct manipulation, the principle of making the user feel like they are in direct control of the interface features, something not present in any past design. The other features of the hardware design remain the same because they are consistent with conventional gas station interfaces everywhere and

are simple and intuitive enough for most users as is. The redesign of the start screen incorporates cash payment as a primary payment option. This additional feature accounts for the most popular form of payment by users, previously requiring users to physically leave their vehicle and enter a store to use. Under the "Other" option, users are presented with options to purchase food or drink within the existing interface and have it delivered to their vehicle, as opposed to entering the store, cutting down on the time spent at the gas station overall. The restroom icon allows users to check the status of the restroom and makes the decision of whether to enter the store much less of a problem. The question mark allows users to speak with the gas station operator inside and ask questions regarding directions or other miscellany while never leaving their vehicle; more options can be viewed with the arrow. The language icons allows users of any ethnicity and background to change the language to the one they are most comfortable with reading. This feature improves the equity of the system by allowing the user interface to deliver the same user experience for all users of any ethnic background. The select language screen displays the most spoken languages around the world and allows users to use arrow keys to toggle and find their desired language. The loading screen now shows a loading icon to assist users with perceiving the current state of the system. Before, the loading screen was just a blank page which widened the gulf of evaluation. Having a loading icon at least informs users to wait, simply making the gulf of evaluation shorter.

The redesigned interface addresses the globalization problem found in the heuristic evaluation. For example a user who just arrived in America from a different country and does not read English would be able to identify their native language and can, at a minimum, operate the system. This shortens the learning curve for the user. The new design also creates smoother feedback cycles allowing the user to perceive the current state of the system better. The delay in returning the feedback wouldn't be an issue as long as users know to wait. This prevents timing issues with executing actions in the interface because users know to wait until the next prompt before executing another command. Flexibility and equity is is now accounted for because users with all ranges of experience can use the interface the same and users of a different native tongue are able to have the same experience as those who read English. The ease of use aspect is accounted for as the interface accounts for all common forms of payment. This redesign is why users will be able to spend less time at gas stations and do more. The cognitive load is on the interface and the system as a whole, as opposed to the user.

Consistency is maintained with the new design as much of the physical buttons and fueling nozzle placement is unchanged. From a pure aesthetics standpoint, the principle of consistency is maintained. The primary payment options on the LCD screen are the same, but more features are added, which can be standardized. Discoverability is maintained because all available actions possible are clearly stated on the screen, as was previously. The user is still constrained by the options on the screen and the buttons on next to it, minimizing the likelihood of user error and slips.

The features of the interface redesign emphasizes usability and usefulness while optimizing efficiency by minimizing the time spent at the gas station. This design builds on existing design principles that proved successful over all the years of the unchanging interface and develops on new principles and methodologies of modern technology to deliver an efficient and satisfying user experience.