Window 7 Light Aware Research

The UX Challenge

Windows 7 includes plugins that utilize sensors available in some PCs. The Windows PC3 team at Microsoft developed an Application Programming Interface (API) that allows applications to use Windows and hardware sensors to detect the amount of light shining on a computer's display. Applications can leverage the API so the sensors adjust the display to improve the visibility of media in a variety of lighted settings.

The PC3 team was working on a Whitepaper to provide prescriptive guidance to Independent Software Vendors (ISVs) regarding the variable settings for media in a variety of settings. For the whitepaper, the focus would be on three media types: images, text, and video. For videos and images the variable setting recommendations would be provided for the following attributes: brightness, contrast, sharpness, color. For text the variable setting recommendations would be for: weight, character spacing, color and background.

Research Challenge

The PC3 product team was working with a constrained budget. This warranted an approach that would yield reliable data without being truly quantifiable. To ensure maximum reliability with a small number of participants, steps were taken to control as many variables as possible. For example, we made sure the lux levels were within a specific range for all of the scenarios tested and made sure that the same media were used for each participant, and that testing of a scenario took place at the same times each day.

The UX Approach

Focus on five unique scenarios and provide a range of acceptable variable settings and an optimal setting for each scenario:

1. Outdoor direct sunlight.
2. Outdoor indirect sunlight.
3. Outdoor variable sunlight (e.g., sunlight dancing on display under a shaded tree).
4. Indoor indirect sunlight.
5. Outdoor sunlight with user moving.

The study was conducted in a primarily sunny location, in June. For each scenario we tested a unique group of users. Each group of user consisted of 8 to 11 total participants. All participants were between the ages of 18 and 60 and regular laptop users. For each scenario we tested a range of variable settings for each of the four attributes (brightness, contrast, sharpness, color) on videos and pictures. With text we tested bold vs. regular, character spacing added, white on black vs. black on white. We used two laptops for the study, one with a matte display and one with a reflective display. Participants rated objects on each of the computers.

Users were asked to compare 2 objects, each with a slightly different setting, and indicate which they preferred. For example, they were shown image a and image b. The participant would chose a preferred image; for purposes of this example let's say they chose image a. They were then shown image a and image c and asked to indicate which they preferred. We continued in this manner until all modifications had been shown and whichever one was standing as the preferred was deemed the "winner" for that attribute and that participant. Second, participants were asked to rate each object with a 1-5 rating where 1 indicated low quality and 5 indicated high quality. Participants were also allowed to rate an item as "unacceptable" if they felt the quality was so low they wouldn't view the object for more than a few seconds.

The Details

Data Analysis:

To score the attribute settings for each object (picture, video, text) we calculated the sum of all individual ratings. For each "win" a setting achieved, an additional 3 points were added to the sum. The median score was then determined by dividing the total score by the number of ratings provided. Additionally, during the study participants were asked to compare each of the winning settings so we could identify an optimal setting for each media type in each lighting condition.

Some key findings:

⇒ Color changes only have an impact on the quality of media when there is more sunlight. Ratings provided for indirect and variable sunlight did not increase and sometimes decreased.

⇒ Changing the brightness with images is the best in direct sunlight while sharpness does better in indirect sunlight.

⇒ Changing the brightness with videos is the best in all settings except indirect indoor sunlight.

⇒ Changes to contrast provided only marginal improvement or decreased ratings in all scenarios.

⇒ White background and black text works best in all settings.

⇒ Results of the variable sunlight while walking were inconclusive since we were not able to repeat the same level of sunlight for each participant when rating the various objects.

The Results

The findings from this research were used to develop a whitepaper that was made available to all developers writing applications for Windows 7. The whitepaper can be found here:

http://www.microsoft.com/whdc/device/sensors/LightAwareUI_values.mspx