

Moving Photography: An Examination of an Automobile Camera

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ABSTRACT

This document presents the findings from a pilot usability study on the use of an automobile camera that can be controlled from the user's steering wheel. The product is in an early conceptual phase, with only a rough prototype that approximates the look and feel, but offering no functional features. Results will show that (i) a number of significant modifications will be needed to the original design to make this product both feasible and usable (ii) the limitations of this prototype prevent accurate testing of most camera functions, and (iii) much further research is needed to understand how people balance their attention while driving with secondary tasks.

INTRODUCTION

In our current age, people are spending more and more time in their cars. Many people must relocate outside the cities they work in to afford housing, but

are forced to trade lengthy commutes. As our society increasingly demands more consumer goods, more drivers are being placed on the road to deliver those goods. With the rising costs of airline travel along with its increased security risks, road travel is seeing an increase in popularity. And for many of us, our hectic lifestyles mean that we are frequently on the go; running errands, shuffling the kids around.

It should come as no surprise then that companies are increasingly coming out with products that make the time in our cars more useful, pleasant, and productive. Examples include automobile GPS systems, DVD players, hands-free mobile phone accessories, and satellite radio. It is in this context that a new option is presented: the Car Camera (CarCAM).

The proposed product is a camera specifically designed for use in a moving motor vehicle. The camera can be mounted to either the interior or exterior of the vehicle, and be manipulated via a control panel mounted to the center of the steering wheel. The camera communicates wirelessly with the control panel using Bluetooth technology. The camera features an LCD display that allows users to view what the camera is focused on (much like the typical digital camera). Several buttons and a small joystick allow users to position the camera, zoom, snap pictures, and record video without ever removing their hands from the steering wheel. Additionally, the CarCAM contains slots for various sizes of flash media and USB so that images and video may be transferred to other devices for storage or printing.

This product is intended for use by people who travel frequently who would like the ability to safely take video or still shots of their journey without pulling over, and without the shakiness of a hand-held camera. Usage is expected primarily by hobbyists, but could also prove useful to those whose job may require capturing photos or video while on the road. Examples may include law enforcement, security, sales-people (video-conferencing), and paparazzi.

USER STUDY GOALS

This study was qualitative in nature. Users were asked to interact with the device as much as possible given the constraints of the current prototype, and provide feedback to the evaluator via open ended questions.

Safety is one of the primary concerns for this product. Can it be used effectively and safely at the same time? How do users handle the multi-tasking required to both drive and operate a camera at the same time? Secondly, does the product provide a quality output (the photos or videos) in a manner that meets user expectations? Thirdly, would the target audience find use in such a product? Is it feasible?

STUDY PARTICIPANTS

Three users were recruited to reflect potential users from the primary audience; people who might take pictures for fun while traveling. The participants included two males, age 35 and 58, and one female age 54. All users own and use digital cameras, and are experienced drivers with their own vehicle.

LOGISTICS

Users were asked to complete the study using their own vehicle. This allowed observation of how the device fits onto a variety of steering wheel designs. It

also diminishes the learning curve required to operate an unfamiliar vehicle, and rule that out as a factor in the study results.

Each user was first asked to fill out a brief demographic questionnaire that included questions about their prior camera usage, including any experiences they might have had with taking photos while driving or as a passenger in a car.

Following the completion of the questionnaire, the study moved to the participant's vehicle. The participant sat in the driver seat, with the evaluator in the passenger seat with a laptop. A wired Quick Cam was attached to the vehicle. Originally this had been planned to mount to the passenger side rear-view mirror, but this proved difficult due to the slick surface and a camera clip that was not thick enough. As an alternative, the camera was affixed to the top ledge of a partially rolled down window on the passenger side. Because the prototype was not functional, the evaluator had to actually snap the photos when the user pressed the "capture" button on the control console and instructed the evaluator verbally to snap a picture. The original test plan also called for the user to verbally instruct the evaluator where to position the camera while they simulated using the buttons. This turned out to be problematic because the Quick Cam would constantly jump out of its cradle when repositioned. The tasks were completed while stationary and also while driving.

Finally, the CarCam console was removed from the steering wheel, and an iPod Video edition was attached to the steering wheel with masking tape. The iPod was set to play a series of pictures via a slideshow set at a specific time interval between slides. This was done to replicate the experience of previewing photos on the CarCam's LCD display. Six sets of three photos were displayed to the user while they were driving. The first two sets had the photos display for ten seconds each, the second two sets displayed for five seconds each, and the third two sets for only two seconds each. Users were told to choose the "best" photo from each set,

DEMOGRAPHICS OF PARTICIPANTS

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over experience with traditional cameras. Years of digital camera usage were 1, 3, and 6. All users had tried to take photos while driving on previous occasions, with only one reporting that they continue this practice. Reasons cited for stopping this practice were mainly the quality of the pictures always turned out so poorly.

TASKS

Each user was presented with the following tasks and scenarios, with the same sequence used within each study.

Imagine that you have just purchased this camera and are going to install it for the first time. How would you attach the control console and where would you position the camera?

Examine the buttons on the console. What do you think each of the buttons does when pressed? Are there any other buttons you'd expect to find?

Place your hands at 9:00 and 3:00. Practice manipulating the buttons with your thumbs. Can you easily reach and control the buttons? If not, what would you change in regards to button position? What would be the most comfortable way for you to manage the buttons while driving?

Imagine that you are driving and want to take a picture of the tree at your 10:00. Position the camera and zoom in to get more detail. Snap the picture when you are ready and speak the words "snap" while you do.

Focus on the building that is on your right at the 1:00 position. Position the camera and when you're ready, take a rapid succession of 5 pictures, speaking the word "snap" each time you snap a picture.

Do these pictures match your expectations of what you thought you were taking?

Start the car and begin driving. Repeat the previous two tasks. How was your experience with taking a picture different while the car was moving?

Normally a preview of what the camera is actually focused on will show up on the screen on your steering wheel. Right now a series of photos is going to be displayed as a slideshow on the iPod to simulate the experience of previewing photos. The photos shown will be of objects/landmarks that you will see during this drive. There will be a series of three photos of each of these landmarks displayed at a preset interval. You will be asked to tell which one

(1, 2, or 3) you thought was best (best can be clearest, most interesting, etc. – you define what is best). Go with your gut and don't over analyze. Glance at these photos for as often and as long as is comfortable to you while you're driving so as to not sacrifice safety.

You will be shown the photo slideshow again that you just viewed while driving (user is now safely pulled over). Please choose the best photo again from each 3 photo sequence.

At the top of this console, you may notice a small pen device as well as a few rectangular shaped slots? What do you think these are for?

The small pen is actually a stylus that would be used to set preferences for the camera on the LCD display. What kind of preferences would you want and expect to find here?

RESULTS

Installation

Two people correctly guessed that the control console mounted to the steering wheel. The third thought it mounted somewhere on the dash, over where the stereo is typically positioned but was unsure how to attach it. All were able to discover that the stretchy strings on the back of the console were used to attach it to the steering wheel, but there was some confusion about which side to place the buttons on. When asked their preference, two people chose to place the buttons on the right, and one on the left. The one left-handed person was one of those who chose the right side, so there is no distinguishable pattern to this finding. All were pleased to hear that the device could be configured to work with the buttons on either side.

Each user chose a different location for mounting the camera. Choices included on the hood of the car (centered just below the windshield), mounted on the roof, and the rear view mirror. Two users expressed concerns with having to drill holes in the car body to mount the camera somewhere. The third user was comfortable with the idea.

Two users felt that the control console was too bulky and should be flatter. One person also commented that the "device doesn't fit the contours of the steering wheel". Two people brought up the issue of the horn being hidden by the device and wondered whether they would still be able to use the horn (or if pressing the buttons on the device would set off the

horn). Another person brought up the issue of in steering wheel airbags and wondered what effect the device would have on the deployment and effectiveness of an airbag.

Positioning, Feel, and Usage of Buttons

All users guessed that the green button was the shutter button (to snap the picture) and claimed it was the color more than the position or shape that led to this conclusion. All guessed that the red button was meant to stop something, but only one person thought that it might have to do with a video camera (the others had assumed that this was a photo only camera). When told that there was a video record option, one user suggested that the video be both stopped and started from the same button but that it not be red.

Only one user guessed that the buttons were meant to be thumb-controlled, saying that it was “similar to a video game controller”. This user had no problem with moving the joystick or other buttons, but the other two found the joystick to be awkward when trying to manipulate it with other fingers. When shown how to position their hands and use their thumbs to operate the controls, all commented that it felt better this way. It was more difficult for one user who had very small hands because she had to lessen her grip on the wheel considerably in order to be able to reach the buttons with her thumb. This was not a problem for the men who had larger hands. Nobody guessed that the two grey buttons were for zooming in and out.

Because the console did not contour the steering wheel (as noted by one user), the console tended to wobble around when trying to manipulate buttons or the joystick. One user called this “awkward” and another said that it would probably interfere with precision in controlling the camera with the joystick.

Taking Photos

All users were comfortable with the use of the green shutter button to snap a picture. One person frequently forgot to speak aloud the instruction to snap the picture, but that is a limitation of the prototype rather than a design issue. Spatially, all users intuitively understood that moving the joystick to the left or right would move the camera in those directions and that moving the camera up or down would change the vertical angle of the picture. Unfortunately all users had trouble with conceptualizing where the camera was actually positioned without use of the preview screen. This resulted in the photos taken by the evaluator not

matching the user’s expectations of what they thought the camera was pointed at.

Additionally, there was a significant time delay in taking of pictures, caused by two constraints of the prototype. First, the limitations of the Quick Cam made it difficult to adjust because it would keep popping out of its cradle. This also made it difficult for the evaluator to adjust the camera with a single hand while clicking the picture with the other hand. Secondly, an added delay occurred from the information having to be verbally relayed from user to evaluator, a delay that would not occur with a real camera.

As a result of all these challenges, little useful information could be obtained with regards to taking photos. The one main take-away is that the camera used will need to be very quick to respond to changes in position and focus, and recover quickly so that multiple pictures can be snapped in rapid succession.

Image Preview

Two of three users had little success with the image preview task. Responses in the post-test matched the driving results less than one-third of the time, which also equals the chance of correctly guessing. These results are therefore, inconclusive. One user, however, scored 83% correct. It is not known why this person did so much better than the others. One hypothesis is that this person was female, and that women have been shown to have a better ability to multi-task. Another hypothesis is that this person is more visual or more aware of aesthetics. This could also be a gender variation, the result of personality, or due to differences in prior learning or past experiences.

	Bobbie	Robert	Dan	% correct
2 seconds (1)	yes	no	yes	
2 seconds (2)	no	no	no	33
5 seconds (1)	yes	no	no	
5 seconds (2)	yes	yes	no	50
10 seconds (1)	yes	no	no	
10 seconds (2)	yes	yes	no	50
% correct	83	33	17	39

There are a number of variables that could also affect the outcome of this piece of the study, that were unable to be tested for. First, the speed at which one is driving is likely to affect the outcome of previewing photos. Very fast driving means that a photo preview would display for only fractions of a

second. Secondly, the other activity in the car or outside the car can provide a degree of distraction and skew the results. Thirdly, driving conditions may affect the outcome – is it snowing, raining, heavy traffic, rough road, etc.?

All users were surprised by the results of this section. The woman thought she would do worse and the men thought they would do better. Two users felt that a bigger display was necessary and one person commented that lighting conditions (heavy daylight) would have a “drastic impact” on their ability to use this feature.

What can be concluded is that balancing the task of driving, with the task of previewing photos will be difficult for some people, and possibly to a degree that negates the benefits of this application. It will also be heavily influenced by environment and circumstances.

Tools and Preferences

Only one person guessed that the rectangular slots were for flash media, though all agreed that this was a much need feature when explained the purpose. Two people guessed that the pen was a stylus, and not just an ordinary pen.

Preferences requested included:

- (a) flash on/off – (1 votes)
- (b) change resolution of photos (2 votes)
- (c) password protect “to keep the kids out” (1 vote)
- (d) “all the features of a standard digital camera, too many to list” (1 vote)
- (e) Save photos to flash media (1 vote)
- (f) Preview/delete photos (2 votes)

All users were asked what they thought of only having the ability to modify preferences when the car was turned off. All three thought this was okay. One person said that they wouldn’t be likely to change anything while driving anyway, and two people recognized that this was for safety purposes. One person thought that other people might be annoyed with it though and think the product was broken unless it was clearly explained somewhere.

Overall Impressions

All users thought the idea behind the camera was good and it was something they’d like to be able to use. Unfortunately most felt that there were just too many issues to make this product truly feasible. One person thought the whole system would work better if positioned on the dash instead of the steering wheel, but also acknowledge that it would be harder

to manipulate something that wasn’t right in front of her. Another person commented that it would be “nearly impossible” to precisely set the focus for a photo while driving at freeway speed.

CONCLUSIONS

Based on the results of this study, the suggested next steps are to put the re-design of the product on hold, while pursuing some necessary research to get answers to questions such as:

- (a) What has already been learned about how people divide their attention when driving?
- (b) Has any research been done on photography in moving vehicles?
- (c) What kind of usability metrics have been collected by manufacturers of other in-vehicle gadgets and what can be learned from these?
- (d) How is moving photography done by those who do it for a living (example – paparazzi)

This information will help to drive the necessary redesign of this product to make it more usable, safe, and useful.

Some design recommendations that can be concluded from the course of this study include:

- a) Make the control console much thinner and lighter weight
- b) Experiment with positioning the buttons such that they attach to the perimeter of the steering wheel instead of in the center (where it conflicts with the horn)
- c) Experiment with making the LCD display larger and having it affixed to the dash or other location (but not on the center of the steering wheel where it can pose issues with the horn, airbags, etc.)

Once the product has been redesigned, a much more functional prototype needs to be created. As demonstrated through this study, an incomplete prototype is insufficient for thoroughly testing a hardware product. A greater number of participants need to be recruited as well. Three people are enough to help bring up issues, but insufficient for testing usability for the larger population.