

Mobile interaction based on eye movement

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Abstract

In the looking for hitherto-unused strategies by which clients and PCs can convey, we explore the value of eye developments as a quick and helpful correspondence mode. As cell phones develop analysts are examining new strategies to facilitate the human-portable cooperation. The obstruction to misusing this medium has not been eye-following innovation but rather the investigation of cooperation methods that join eye developments into the client PC exchange in a characteristic and unpretentious way. This paper discusses some of the human factors and the possible technical considerations that can arise by using eye movement as input medium.

Keywords: Mobile sensing systems, machine learning, gaze points.

1. Introduction

Human-Computer Interaction (HCI) scientists and telephone merchants are consistently hunting down new ways to deal with diminish the exertion clients apply while getting to applications on restricted frame factor gadgets, for example, cell phones. The most noteworthy development of the previous couple of years is the reception of Touch screen innovation presented with the Apple iPhone and as of late taken after by the various real merchants, for example, Nokia and HTC. The touch screen has changed the way individuals interface with their cell phones since it gives a natural approach to

perform activities utilizing the development of at least one fingers on the show (e.g., squeezing a photograph to zoom in and out, or panning to move a map). Several late research ventures exhibit new individualsto-cell phone associations advances. We here adopt alternate strategy Eye development based collaboration. This should be possible by catching the clients eye development by means of the phone's forward looking camera to trigger the activities of the telephone. Controlling a PC utilizing the eyes generally implied extricating data from the look, that is, the thing that a man was looking at [1].

HCI (Human Computer Interaction) and HPI (Hardware Platform Interaction) stretches out their difficulties identifies with telephone a how we utilize it. HPI goes for progressing and encouraging the collaboration of individuals with cell phones. Any telephone's sensors, e.g., accelerometer, spinner, or camera, utilized as a part of a HPI innovation must consider the imperatives that versatility brings into play.

For instance, if the telephone's camera is embraced in a HPI application the diverse light conditions an obscured video outlines because of versatility make the utilization of the camera to deduce occasions extremely difficult. Therefore HCI innovations should be reached out to be appropriate to HPI conditions. To address these objectives HPI innovation ought to be less nosy. It ought not to depend on any outer gadgets other than the cell phone itself. It ought to be promptly usable with least client reliance as could reasonably be expected. It ought to be quick in the induction stage. It ought to be in lightweight regarding calculation. It should protect the telephone client encounter[3]. We trust that HPI

inquire about advances will create a jump forward in the way individuals utilize their cell phones by enhancing individuals wellbeing. This will encourage the utilization of cell phones for hindered people(physical tested people).We here proposes the eye-development based cell phone, the principal framework fit for following a client's eye and mapping its present position on the show to a capacity/application on the telephone utilizing the telephone's forward looking camera. Eye Phone enables the client to actuate an application by basically "flickering at the application", imitating a mouse click. While different interfaces could be utilized as a part of a sans hand way, for example, voice acknowledgment, we concentrate on misusing the eye as a driver of the HPI [5].

We trust Eye Phone innovation is a critical contrasting option to, for instance, voice actuation frameworks in view of voice acknowledgment, since the execution of a voice acknowledgment framework has a tendency to corrupt in boisterous conditions. The front camera is the main necessity in Eye Phone.

The greater part of the cell phones today are furnished with a front camera and we expect that numerous more will be presented. Later on (e.g., Apple iPhone 4G) in help of video conferencing on the telephone. The Eye Phone framework utilizes machine learning methods that subsequent to identifying the eye make a layout of the open eye and utilize format coordinating for eye following. Relationship coordinating is abused for eye wink recognition.

2. Challenges faced by HPI

HPI confronts chiefly two difficulties:

- Mobility challenges
- Hardware bolster.

These two difficulties should consider in order to accomplish a decent client companion operation in the keen versatile.

Mobility challenges

One of the prompt items of portability is that a cell phone is moved around through unpredicted setting, i.e., circumstances and situations that are difficult to see or foresee amid the outline period of a HPI application.

A cell phone is liable to uncontrolled development, individuals collaborate with their cell phones while stationary, moving, and so forth. It is practically difficult to anticipate how and where individuals will utilize their cell phones. A HPI application ought to have the capacity to work dependably in any experienced condition. What is testing is having the capacity to recognize the motion itself and some other activity the individual may be performing. In the event that the telephone's camera is utilized to derive a client activity, it winds up noticeably imperative to make the induction calculation working on the video caught by the camera hearty against lighting conditions, which can change from place to place. Furthermore Video outlines obscure because of the telephone development. Since HPI application designers can't accept any ideal working conditions.

Hardware challenges

Any HPI execution ought not depend on any outer equipment. Requesting that individuals convey or wear extra equipment so as to utilize their telephone may lessen the entrance of the innovation. Besides, best in class.

HCI equipment, for example, glass mounted cameras, or devoted head protectors are not yet sufficiently little to be similarly worn for drawn out stretches of time by People. Any HPI application should rely however much as could reasonably be expected on quite recently the telephone's ready sensors.

3. Eye phone design

We can build up the eye-following and squinting innovation by utilizing some mind boggling calculations initially intended for desktop machines utilizing USB cameras.

The Eye Phone algorithmic outline separates into the accompanying pipeline stages:

1. An eye discovery stage
2. An open eye format creation stage
3. An eye following stage
4. A squint recognition stage.

4. Eye detection

By applying a movement investigation method which works on continuous casings, this stage comprise on finding the form of the eyes. The eye-collaboration based pc (which is now accessible) distinguishes just the eye combine with no mistake when running on a desktop PC with a settled camera, But this can't be actualized in cell phone because of the pixel confinements in the front camera and furthermore because of the unavoidable development of the cell phone when it is person's hand.



Fig. 1: Movement investigation

Thus, we propose to modify the original algorithm by:

- i) Reducing the image resolution, in turn reduces the eye detection error rate.
- ii) Adding two more criteria to the original heuristics that filter out the false eye contour.

5. Open eye template creation

While the creators in receive an online open eye format creation by removing the layout each time the eye match is lost (this could happen due to lighting condition changes or development on account of a cell phone), Eye Phone does not depend on a similar system. The diminished calculation speed contrasted with a

desktop machine and the confined battery prerequisites forced by the managefor an alternate approach. Eye Phone makes a layout of a client's open eye once toward the starting when a man utilizes the framework interestingly utilizing the eye discovery calculation. The layout is spared in the diligent memory of the gadget and brought when Eye Phone is conjured. By adopting this straightforward strategy, we definitely diminish the runtime derivation postponement of Eye Phone, the application memory impression, and the battery deplete. The drawback of this disconnected format creation approach is that you made in certain lighting conditions won't not be flawlessly appropriate for different situations. We plan to address this issue in future [8].

In the present execution the framework is prepared separately, i.e., the eye format is made by every client when the application is utilized interestingly. Later on, the eye formats are researched by depending on pre-gathered information from different people. With this regulated learning approach clients can promptly utilize Eye Phone without experiencing the underlying eye layout creation stage.

6. Eye tracking

Let us know about the Eye-tracking algorithm:

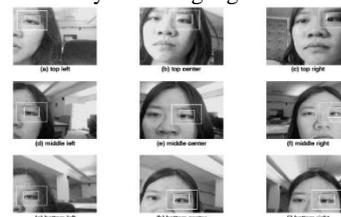


Fig. 2: Eye tracking

The eye following calculation depends on layout coordinating. The format coordinating capacity computes a relationship score between the open eye layout, made the first run through the application is utilized, and a pursuit window. With a specific end goal to decrease the calculation time of the layout coordinating capacity and spare assets, the inquiry window is constrained to a district which is double the measure of a case encasing the eye. These areas are appeared in figure where the external box around the left eye encases the locale where the connection score is ascertained. The relationship coefficient we depend on, which is regularly utilized as a part of layout coordinating issues. This coefficient extends between - 1 and 1. From many trials this coefficient ensures preferable execution over the one utilized as a part of. In the event that the standardized relationship coefficient levels with 0.4 we reason that there is an eye in the hunt window. This edge has been confirmed exact by methods for various examinations under various conditions (e.g., splendid, dim, moving, not moving) [10].

Blink detection

In the Eye Phone system, we have two situations to deal with:

- a. The quality of the camera is not the same as a good USB camera, and
- b. The phone's camera is generally closer to the person's face than

Because of this latter situation the camera can pick up iris movements the interior of the eye, due to eyeball rotation. In particular, When the iris is turned towards the corner of the eye, upwards or downwards, a blink is inferred even if the eye remains open. This occurs because in this case the majority of the eye ball surface turns white which is confused with the color of the skin.

Eye blink classification

The change of the connection coefficient in time is investigated keeping in mind the end goal to distinguish the willful eye-flickers of span more noteworthy than 250ms. On the off chance that the

estimation of the coefficient is lower than the predefined edge esteem TL for two back to back casings - the start of the eye-squint is distinguished. The finish of the eye-flicker is found if the estimation of the relationship coefficient is more prominent than the limit esteem TH. The estimations of the limits TL and TH were resolved tentatively. In the event that the span of the identified eye-flicker is more prominent than 250ms and shorter than 2s, at that point such squint is viewed as the "control" one.

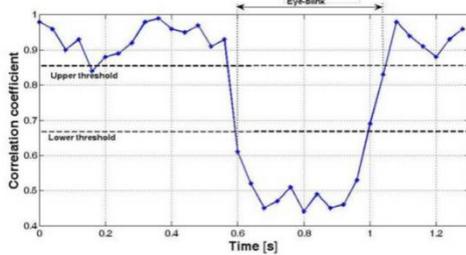


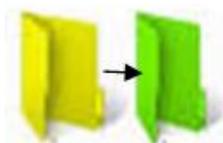
Fig. 3: Eye blink classification

7. Functions based on eye-movement

Here, we propose some functions that could be made with mobile phones based on the eye-movement.

- Selecting the folder
- Getting more options from the folder.
- Come to previous menu or screen.
- Copy and paste.
- Scroll-up and scroll-down.
- Pause, stop and play in case videos.
- Zoom in and zoom out in images.

Selecting the folder



Initial color Blink to select

The organizer in versatile screen can be chosen by simply watching that specific envelope for some time. There are chances for the choice of an excessive number of envelopes because of the concentration of our eye-ball.

We can check eye to get the position of eye and can ascertain the season of center. If the figured time surpasses the farthest point in time(say somewhere in the range of few nano seconds) the envelope shading changes showing the client what they are focusing for that minute. What's more, after the specific stage is achieved the client can flicker, and that can be perceived by the squinting innovation as clarified previously.

For instance: Let us take the underlying shade of the envelope or an alternative be yellow .when centered for at some point , it turns green, And after that we can flicker to choose that specific organizer.

Get more options



Initial color Blink to get options Blink to select.

As we as a whole utilize mobiles, we can get the alternatives that are not appeared around then can be seen by choosing some different techniques. Be that as it may, for this situation, we can't see the choices just by observing the envelopes. we can acquire this by changing the shade of the organizer by different hues.

For instance: when we concentrate on a specific envelope for quite a while, let it shading changes to green color(from yellow, as said above).if we need to see the choices , we can squint at this stage. Furthermore, subsequently, we can choose the organizer by simply viewing the envelope for some additional time. To maintain a strategic distance from vagueness we can change the shade of the envelope once more (say to blue color).and flicker at this stage.

The blink of the user eye may be known by the blinking technology as explained above.

Navigate to previous screen

In the versatile, we have a different catch or in touch to return to past screen. In Eye-Tracking innovation we propose to actualize this by flickering our eye twofold times. Again the squinting innovation comes into the part to track the squinting of the eye and recognizes it.

Copy and paste



Fig. 4: Demo pictures of Folders

To duplicate and glue a specific organizer, we can utilize the route strategy. The client can see and center the specific envelope that he needs to duplicate and hold up till its shading changes (This shading change is to confirm the required organizer). What's more, when the required phase of the organizer is gotten , we can choose i.e., can duplicate it by moving your eyeball to either side of the portable on a level plane.

To glue the organizer in the specific region , we can simply observe over the screen to get more choices for the specific window can choose "glue" choice in it.

Scroll-up & scroll-down



Fig. 5: Moving up and downs

We can also make it possible to scroll up and down the screen by seeing on the top line or the bottom line of the screen respectively. This can be achieved by scanning the eye ball position.

Pause, stop & play videos



Fig. 6: Demo picture

We can likewise make the portable to play the video while the client sees the screen and can stop it when the eye center outside the screen. This should likewise be possible keeping in mind the end goal to spare the battery and furthermore abstains from playing of video when the client does not watching it.

Zoom in & zoom out

We can likewise zoom in and zoom out the pictures just by viewing on the picture. By utilizing the camera, the focusing of eye can be gotten through the camera. The position of the eye can likewise be gotten and can be utilized to zoom the picture by focusing on that point. The zooming out operation can be performed by us seeing out of the screen.

8. Conclusion

From a business point of view, eye-following programming likewise has intriguing repercussions for publicizing, conceivably enabling organizations to tailor advertisements in light of the parts of a story or screen where individuals really look. Be that as it may, there are additionally a lot of conceivable cons. Since the innovation is still in its initial days, directing the screen with a come-here look won't generally be exact. Simply think about the issues clients have had with Apple's Siri and Samsung's Voice associates. It's likewise a possibly valuable availability highlight Developments could look cumbersome in broad daylight, and diversions could undoubtedly keep your spheres dashing along these lines and that, meddling with the following programming's conduct. Battery life is an issue, since the telephone would need to be alert to watch out for you.

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