

QWIKEYES – A LIVE VIDEO CALLING ASSISTANT

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I. ABSTRACT

Blind people face a number of visual challenges in their daily life – right from reading the label on a frozen dinner to figuring out if they're at the right bus stop. While many tools have been introduced to help address these problems using computer vision and other sensors, (talking OCR, GPS, radar canes, etc.) their capabilities are dictated as much by the state-of-the-art in technology as they are by real human problems. A deeper understanding of the questions that blind people would like to ask in their day-to-day lives may help to direct innovation to solve them.

Qwik Eyes[1] is a live video calling service that utilizes hybrid mobile technology for providing real time assistance to people with vision impairments. We will discuss in the following topics how we achieved this.

II. STATEMENT OF CONTRIBUTIONS

After losing his eyesight in a motorcycle accident at age 18, Bryan Duarte struggled to perform daily tasks that once had come naturally to him. His experiences motivated him to find a solution that would help other visually impaired people coping with similar challenges.

While there are currently a few existing technologies to assist people with vision impairments, they target only a particular ailment / task rather than something that can be used on all fronts by the person.

A good example would be the use of Brainovi[2] - a 3D Braille GPS can widely be attributed to movement or navigation. The Brainovi uses a combination of spoken directions that's relayed over Bluetooth wireless earpieces and a physical 3D map created on the pin matrix surface of the device. Users can enter their destination verbally, and the Brainovi calculates the route. But if the person wants help reading something written on a bill board, the Brainovi is of no help to him there. The person is naturally forced to use some other form of technology.

There are other factors too that affect the growth of technology such as cost, bulk and social stigma. A good example is a talking OCR. It would definitely be a little uncomfortable to carry a bulky machine everywhere with you, not to mention the unwanted attention you'd get from people.

On the other hand, we have apps working on a similar logic as ours, but fail to deliver on what they promise. Be My Eyes[3] is a famous application which works on similar lines as Qwik Eyes.

Instead of having a dedicated support specialist, they rely on volunteers to help out the blind. Because of this, the wait time can vary drastically and also there might also result in never getting reply. Qwik Eyes is designed to have a trained specialist support round the clock with minimal wait time and a guarantee that you will be helped.

With Qwik Eyes, we aim at creating something which does not require the user to invest in any

additional hardware. All that is required is a phone with a decent camera. The user has to download the application on his phone and login. With a tap-to-click functionality, the user would instantly be connected with a support specialist. The support specialist would automatically have access to the person's camera. Now, all that the person has to do is point the camera in a general direction, and the specialist could easily guide him/her from there.

III. PROPOSED SOLUTION

The main focus of Qwik Eyes is providing quick, reliable assistance to its users while maintaining a secured infrastructure. We first created a mobile app with a simple interface to provide convenient access to the users. Design considerations like having a simple UI and intuitive navigation were prioritized in order to give people with visual impairments the ability easily access the app and all of its features with a few accessibility features found in all iPhones and Android phones.

The main feature of this app is the ability to start a voice call with a member from a dedicated support staff who is employed by Qwik Eyes. During this call, the user can point their camera whichever way they want and ask the staff member any question concerning the content of the video. Because it is a two way call, the staff member is able to interact with the user and is able to give him useful information, instructions, and clarifications, acting like a new pair of eyes for the user.

On this app, there is also a secured login feature that communicates with our secured server on the cloud. This was an important feature to add because it protects unwanted access to some sensitive information like payment information or contact information.

Fig 1. shows the complete architecture and working logic of Qwik Eyes.

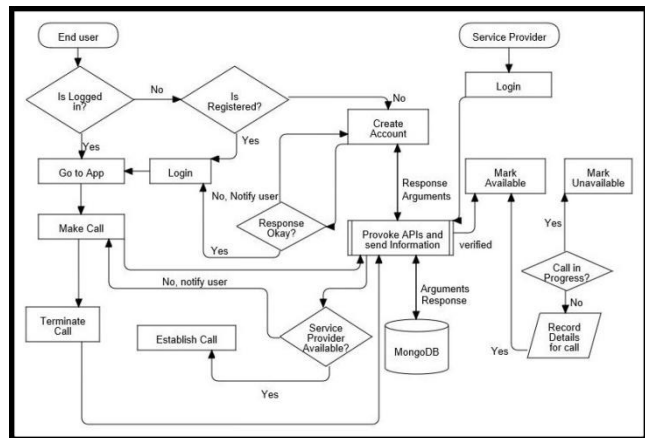


Fig 1. The architecture of Qwik Eyes.

We decided to build a two-part solution for Qwik Eyes in order to support the requirements. This consisted of a front-end hybrid mobile application built using Ionic Framework[4] and PeerJS[5] which is essentially controlling the use of WebRTC[6] to support video calling and real-time communications[10] along with a powerful yet simple back-end built using Python [7] and MongoDB[8].

Front End: The Front end is a hybrid app with multiple fronts; one for the end-user and one for the service provider, both which could be deployed to 3 separate Mobile Operating Systems - Android, iOS and Windows and as well as on the web while maintaining accessibility services across all platforms[9]. The front-end was built on a hybrid platform because we wanted to ensure that we could reach out to the maximum number of people and that the choice of their preferred use of platform caused no hindrance to them while using the application.

Also, in order to support efficient usage of the app, we ensured that communication was established over a peer-peer network to avoid bottlenecks at the server end or other issues that might come up in future. In order to further enhance the speed and reliability, we removed the “self review” feature available in most video calling software as it was not critical to the application usage and lowered computation capabilities dramatically.

Back End: The Backend was built using the flask framework for Python which interacted with the MongoDB server to register and authenticate both end users and service providers, and also identify available service providers and create session information between the front-end user and the service providers. The Back-end is currently hosted on the cloud platform - IBM Bluemix and we were able to use this in real time and test our solution.

Performance: We were able to use the app in our test environment with 4 end users and 4 service providers across all mentioned platforms. Due to lack of manpower at this stage, we were not able to test it even further. The conclusion of our tests was that we were able to perform the necessary operations with minimal computing on cloud while maintaining user performance. Calls placed were able to last upwards of 2 hours with quality only slightly diminishing after that due to over usage and blocking of computation by the app on either ends. We will be working in future to optimize this issue as well.

IV. SOLUTION VALIDATION AND DISCUSSIONS

With a staggering 36% of the US work force population being visually impaired[11] with no proper technology to assist them in their everyday life was one of the biggest factors that motivated Bryan to start Qwik Eyes. Losing his eyesight at an early age also gave him a new perspective towards life. He started recognizing difficulties faced by visually impaired people and having tried many solution himself, he wanted to make something which would help visually impaired people effectively. He came up with an idea to develop a simple mobile app which could assist people from all aspects of life.

We believe the solution to develop an application which can assist people in real time is quite practical and very much in need now. There are various different situations, where visually impaired need help. And these situations might not be big enough to develop a specific technology to assist for that task but still needs to be addressed. Consider following use cases as examples:

Case 1: Consider a visually impaired person who is very well acquainted with cooking in their kitchen and has everything in kitchen placed in their specific location. The person is able to cook and manage their daily kitchen activities with no outsider help. But if the items in the kitchen are misplaced, it becomes a daunting task for them. They need to wait for someone to help them out and till then they are rendered helpless.

Case 2: Consider a visually impaired person trying to navigate on their own and ending up at an unfamiliar location. Technology might help with guiding through routes, but being in an unfamiliar place and completely relying on technology to keep going can seem intimidating. In such a situation the person will have to again wait for someone to help them.

The situation where we can locate something might seem very trivial to us, but for visually impaired it is a big problem. Developing technology to locate items completely with help of technology might be complicated and there are so many diverse situations and many different types of objects that need to be located.

A situation where the person just needs some sort of human assurance that they are going right way could make all the difference. That is where Qwik Eyes comes into picture. We aim at providing a "human touch" to technology.

With the help of Qwik Eyes, we can attest that one video call can solve all the problems mentioned above and a few more, all being cases where a person needs immediate

assistance. This video calling application is such a simple and an effective solution to address problems which technology may or may not be able to address. This application is cost effective and can be used for various purposes. Since this application is launched on various platforms of smart-phones, it is easily accessible. Also since there is a dedicated support team at back-end, people wouldn't need to go through a huge wait-list and most importantly, your call is sure to be answered. The user need not depend on anyone just to make calls, thus giving them a sense of independency.

Having many pros, there are also few constraints about this application. This application can be fast and effective solution for numerous small issues, but the ability to get an accurate response also depends on the support specialist assisting you. With time and training, they can definitely improve their skills in helping people.

V. CONCLUSIONS

QwikEyes aims to augment the lives of the blind in the areas of education, profession, personal and social interaction; A complete mental and physical growth. It empowers the user with a sense of independence by assisting them remotely. There are many specific problem related solutions to assist the visually impaired people, but this solution can be the answer for the quick help need to lead a normal life. Even though, there are similar concept based solutions of web applications, they are crowd sourced, which means long wait times, with no guarantee of you being helped. This defeats the entire purpose of real time assistance. With Qwik Eyes, one can be assured to get answers to those challenges by having a dedicated support team.

VI. REFERENCES

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