

Interactive Qualifying Project Digital History Display

A Legacy for The Worcester Armenian Community



Sponsor: Armenian Church of Our Saviour, Worcester

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Background

Introduction

Since escaping the Armenian Genocide of 1915, many Armenian immigrants have settled in the area surrounding Worcester, Massachusetts and established their own faith community. Over the years, as the population grew and evolved, many members of the community requested that their deceased family members, including Genocide victims, be memorialized by their parish, often with a donation in support of their parish. Today, the desire to remember departed parish members remains. As a team, we inherited a physical card library of 411 unorganized pictures with no way to find photos of family or friends. Many cards were becoming torn and brittle. We were tasked with upgrading this aging display of cards into a 21st century digital solution that would memorialize all of these past friends of the church. The parish leaders envision an intuitive, inviting, and easily navigable electronic display capable of showing any one of an index of memorialized parishioners. The software platform used to display this information must be easy to manage, update, and change. This system is also envisioned to be capable of other uses, such as displaying a church calendar, upcoming events, or special recognition during a wedding or funeral.

The Client

Our client for this project is the Armenian Church of Our Savior (ACOOS), an Armenian Apostolic church located in Worcester, Massachusetts. This church is most famous for being the first Armenian church in the Western Hemisphere,¹ but its history is so much more than even that heavy title implies. Since its construction in 1890, the church has been a place of gathering,

¹ Papazian, Dennis. "Armenians in America." *Journal of Eastern Christian Studies* (2000): 311-47. Print.

worship, and pride for all Armenians in the area. They turned to the church during times of great struggle during the Armenian Genocide of WWI, and they have continued to turn for guidance ever since.

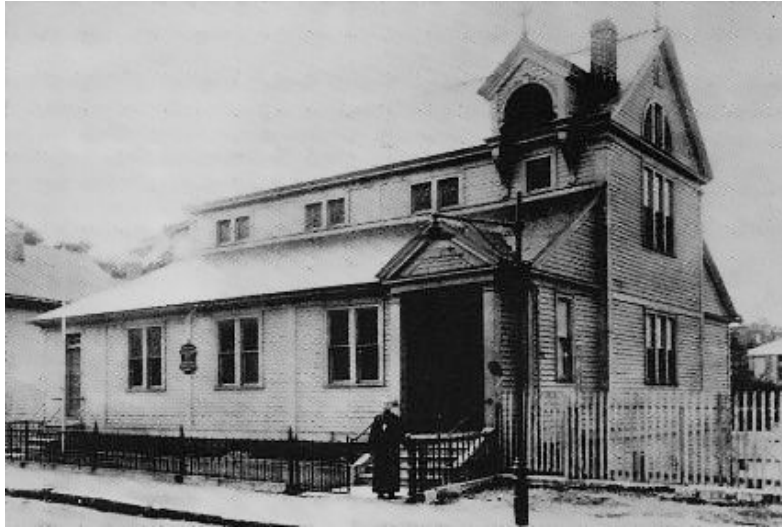


Figure 1: An early image of the Armenian Church of Our Savior

The ACOOS was a pioneering endeavour for many Armenians in the Northeastern United States. By the early 1800s, small groups of Armenians began to immigrate to the US, and their numbers increased greatly by the late 1800s as they sought to escape persecution from the Ottoman Empire. As their numbers swelled, the Armenian people of America knew that they wanted to build a church, although it would be a huge effort considering they were still in the vast minority in Worcester.² People from the Worcester area began to accept contributions from Armenians to begin construction on what would become the ACOOS.³ They, however, did not expect the massive reception that was given to them. Purportedly, according to historian Dennis Papazian, people as far south as Washington D.C. donated money to building this church in a town hundreds of miles away.⁴ The church construction was finished and consecrated in

² DiCanio, Margaret. *Memory Fragments from the Armenian Genocide: A Mosaic of Shared Heritage*. New York: Mystery and Suspense, 2002. Print.

³ Laderman, Gary. *Religion and American Cultures*. Santa Barbara, Calif: ABC- CLIO, 2003. Print.

⁴ Papazian, op. cit.

1891, 7 years before the foundation of the Armenian Diocese of America.⁵ This is one of the most incredible facts about the history of the church: it was not just the first Armenian church in the US, but it was the first Armenian identity in all of the Western Hemisphere. Before it, people in America had never paid attention to this tiny minority, but now they could finally see a piece of the Armenian culture. The ACOOS was truly the greatest pioneer for identity of the Armenian people in the Americas.

In addition to its financial achievements during its construction, the church also became a vehicle of cultural change for Armenians from the Worcester area. In her 2002 book *Memory Fragments from the Armenian Genocide*, Dr. Margaret DiCanio said that "the construction of the small church gave the Armenians of Worcester a measure of respect from the larger community not previously given. One man recalled that his father was no longer beaten at the wire mill after the church was built."⁶ This grim example demonstrates a larger trend that happened after the construction of the church: non-Armenians from the area began to see Armenians less as an alien minority, and more as just people from a different background.⁷ In this way, the ACOOS became a force for social change during a time of still deeply-ingrained generational hatred and fear among Americans.

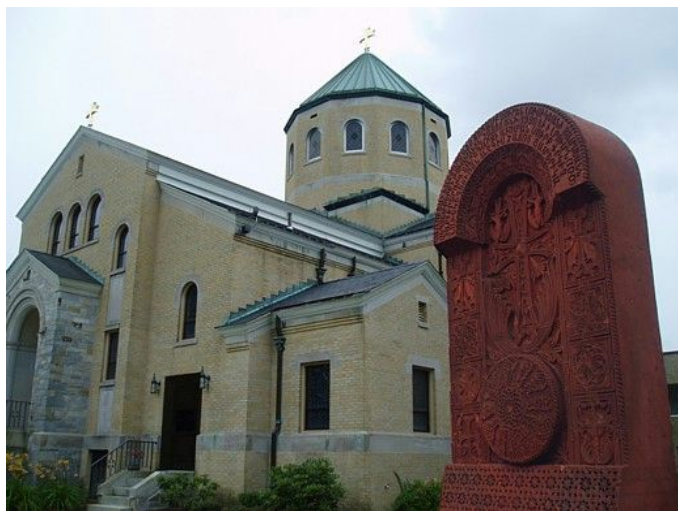


Figure 2: The present-day church and their 100-anniversary Khatchkar

⁵ Armenian Church of Our Saviour. Web. Dec. 2015. <<http://www.acoos.org/>>.

⁶ DiCanio, op. cit.

⁷ Ibid.

The church has undergone some notable changes since its construction in 1891. Due to various ongoing problems, the original building was demolished and rebuilt in 1952.⁸ During the process, the church was relocated to its current location on Salisbury and Dean Street. The building then remained mostly the same for another half-century, until a series of renovation projects started in 2005. This included replacement of the facilities' sidewalks, a major renovation to the church hall, some changes to the church sanctuary, as well the construction of the new Sunday School.⁹

The Need

Sometime in the 1900s, the ACOOS began a fundraising campaign to memorialize parish members and document a legacy of the church parishioners.¹⁰ Families who wanted their passed relatives to be remembered would provide a photo and some information to the church. They would be supporting the church through a donation and individual pictures and cards would, in return, remain a permanent part of the history of Armenians in Worcester and the Church of Our Saviour. The church continued this fundraiser for many years, until they could no longer feasibly display the cards on a wall. The cards were collected into small booklets and hung as packages in a small area of the church, shown in **Figure 5**.

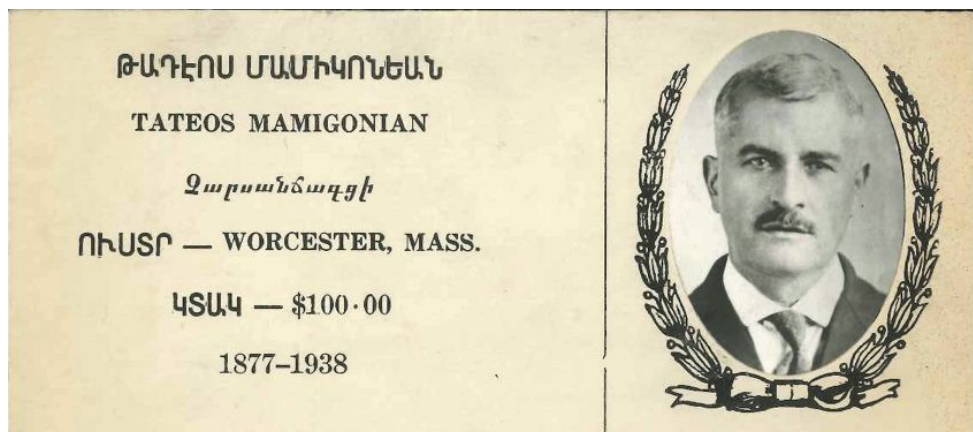


Figure 3: A sample card from the original ACOOS memorial.

⁸ Armenian Church of Our Saviour, op. cit.

⁹ Ibid.

¹⁰ Mazmanian, Greg. "Digital History Display IQP Meeting." Personal interview. 22 Sept. 2015.

This solution worked for the cards for a number of years, but it had problems. First, it was very difficult to add to the cards. A new card would have to be manually put together and printed out, and placed in the correct spot on the correct ring. Then, someone would only see that card if they happened to leaf through that specific booklet and see his picture. However, the biggest problem with displaying the cards in this manner was the church leaders did not feel like they were doing justice to the hundreds of families who had paid a fairly large sum of money for this individuals remembrance.

From this problem, our project was conceived. Parish leaders thought the cards could be collected into an electronic system that displays the cards in a much better way, is capable of telling unique stories about the people of the church, and is more interesting for people to use. The challenge for them was - they did not know the options to move from manual to digital, nor how to implement and maintain an electronic system. They knew what they wanted a system for, but not exactly what they wanted it to look like, or how it would function, or even where it would go. To summarize the need as described by church leaders themselves, the following is a list of needs for the system as described during our first meeting with advisers from the church:

- The system should have a strong focus on memorializing the members of the church through the digitization and display of the cards.
- The display should “catch interest of the young eye” to get young churchgoers involved in its history.
- “The Church has not leveraged technology within the facility,” so their ultimate hope is to have a system that can display church leadership information, upcoming calendar and organizational events, and to provide a “central vehicle” of communication between churchgoers and leadership.

As this short list suggests, the leadership from ACOOS had no idea what they wanted this system to look like, but they had a very clear understanding of what it is they needed. This clarity provided us a very good basis for designing the system that ACOOS needs.

A Brief History of the Armenian People

The Armenians are an ancient people who have existed since before the first century C.E. The traditional land of Armenia has grown and shrunk constantly throughout its long and difficult history. Once encompassing most of the modern day Turkey, Armenia has now shrunk to the size of present-day Republic of Armenia. The name of the land was given to the people by its neighbors. Inhabitants of the land refer to it as “Hayastan,” derived from the name Haik, a descendant of biblical Noah, and “stan”, the persian word for land.¹¹ Armenians have their own language, distinct from other Indo-European languages through its own letters and grammar.

In 301 C.E, Armenia became the first nation to adopt Christianity as a state religion.¹² Therefore, Christianity has become a deeply rooted aspect of Armenian history and culture. The majority of these Christian Armenians belong to Eastern and Western dioceses of the Armenian Apostolic Church, a particularly orthodox form of Christianity.

Armenia, in ancient times, was traditionally a kingdom. It was not until recent years, after the defeat of the Ottoman Empire in 1918, that Armenia gained its independence and became a republic. This independence was short-lived, however, as Armenia was invaded in 1920 by the Red Army, becoming a soviet state. The land remained under soviet control until

¹¹ Panossian, Razmik. *The Armenians: From Kings and Priests to Merchants and Commissars*. New York: Columbia UP, 2006. Print.

¹² Lang, David Marshall. *Armenia, Cradle of Civilization*. 2d ed. London: Allen & Unwin, 1978. Print.

the dissolution of the Soviet Union. The Republic of Armenia then became the first state to declare its independence in 1991, and has remained an independent democracy to this day.¹³

Despite contributions to literature, music, and art, the most well-known and influential event in the history of the Armenian people is the Armenian Genocide. During the 15th and 16th centuries, Armenia had largely come under Ottoman control. The Armenian people during this time grouped under the name *millet* (community), and were concentrated on the eastern side of the Ottoman empire.¹⁴ In accordance with the dhimmi system, a practice of tolerance in many muslim countries, the Armenian people were afforded limited freedom by the Ottomans. Their long suppressed relationship leading up to WWI fueled hatred and fear between the people of Armenia (orthodox and apostolic christians) and the rest of Ottoman Empire (muslims).¹⁵ It is this disconnection between Armenians and muslim Ottomans that lead to the massacres of Armenians during WWI.

After nearly a decade of internal tension within the Ottoman Empire between the Young Turks movement and traditionalists, the Ottomans entered WWI in a state of dissolution. The empire opened the Middle Eastern front of the war on the side of the Central Powers, against the Allies. As the Ottomans attempted to push forward into Russia, they on multiple occasions asked the Ottoman Armenians for help against the Russian Armenians and the Russian army. The Armenians largely did not cooperate, with some groups of Armenians even turning to assist the Russian army against the Ottomans.¹⁶ By 1915, Ottoman officials saw Armenians as a threat to their war effort that would have to be terminated if they had any chance of winning. This marked the beginning of the Armenian Genocide, as Armenians start to be taken from their

¹³ Panossian, op. cit.

¹⁴ Ibid.

¹⁵ Ibid.

¹⁶ DiCanio, op. cit.

homes, led to concentration camps, and killed. While no one is sure of the number of individual lives taken during the genocide, the United Nations recognizes that it is between 800,000 and 1.5 million. The grim details of the extermination involve death marches, concentration camps, kangaroo court sessions of victims, stealing of millions of dollars in Armenian property, along with public executions.¹⁷

The Armenian Genocide has had an incredibly strong effect on the Armenian people. Today, what is most disheartening for many is the failure of a few countries, notably the U.S, Israel, and Turkey, to recognize the Armenian Genocide as a genocide. This has long been due to the alliance between Turkey and other NATO countries that do not want to dissolve their relationship with Turkey. Incirlik Air Base in Turkey, the home of 57 US B61 nuclear warheads, is located in a tactical spot to control Middle Eastern conflict that US forces could never afford to lose.¹⁸ While many Armenians are hurt by countries' failures to accept the genocide, many insist that it does not matter. To them, whether it is "officially" recognized is irrelevant, because real justice will never come for the people of Armenia hurt by the genocide.

¹⁷ Ibid

¹⁸ "Turkey Agrees to Allow U.S. Military to Use Its Base to Attack Islamic State." The Washington Post 23 July 2015. Web. Dec. 2015.

Methods

At the beginning of the project, the clients had a very loose idea of what they wanted the end product to look like. As a result, a lot of design and decision making was involved in the creation of the product. This section explains the whole process of creating the product, including notes from meetings, reasoning for making high-level decisions, and notes about technologies used during the process.

Early Meetings

The first time we met as an IQP Team was on September 11, during the first weeks of A term. During this meeting, we met without our client advisors, so the tone of the meeting very much focused on IQP objectives instead of the product itself. One of the most important discussions of the meeting was defining a preliminary timeline to get the project completed by the end of B term. This chart of the schedule is shown in **Appendix A**. We also made first contact with our clients through email:

Greetings Der Aved and Greg,

I am a student at WPI working with Chris Dowding and Dean Oates. I am very excited to be working on this project, and understand the gravity this holds with the ACOOS community. We are confident that we can build a system that will be used and admired by the church and its visitors for many years to come.

I would like to set up a time when we can meet with one or both of you in the next week. The goals of this meeting are to better understand the community and the history of the church, and to identify parameters that will be important in the design process. As such, we are proposing one of the following times next week:

- Monday, September 21, from 4PM to 6PM.
- Tuesday, September 22, from 4PM to 6PM.
- Wednesday, September 23, from 3PM to 5PM.

Please let me know if any of these times work for you.

Regards,

Andrew McAfee

Our next important IQP meeting was with the clients at the Armenian Church of Our Saviour on Tuesday, September 22. This was a very important meeting to us, as it was the first time we would really understand what the problem was and what any kind of solution would look like. We met in the church parish with Greg Mazmanian and Ed Atamian, a picture from which is shown in **Figure 4**.



Figure 4: Photo of first meeting with clients. From left: Ed Atamian, Greg Mazmanian, Andrew McAfee, Chris Dowding

This meeting was extremely helpful in our understanding of the project and was the basis for preliminary designs. The most important information gathered was:

- The desired digital display would be a replacement for physical cards that were once hung on the wall of the church as a memorial to those from the area who had passed away.
- The clients had very little predefined idea about what this display would look like, or how people would interact with it.
- Visual and usability design are very important in the creation of this product, as the desired system would be used by a wide variety of people.

- Three possible locations that the display could be located, depending on its size and traffic requirements. The location that would eventually become the product location is shown in **Figure 5**.



Figure 5: Photo of eventual product location during first client meeting

Following this meeting, we met again the following week to decide on some designs that we would present to the clients. From the information gathered in the previous meeting, we came up with four potential designs, each with some strength and weaknesses that we determined. Each of these designs is shown in a slideshow shown in **Appendix B**.

During this next meeting, we were again in the church parish to present the designs we had prepared. We discussed and explained each design and its strengths, as well as addressed other issues including mounting the system on the wall, cost analysis of each design, providing content for the display. Based on their feedback, we decided to go with Design 1, as described in the slides. This design involves the use of a touchscreen mounted at the front of the church within an arch next to the front door. The full reasoning for choosing this design is described on

the second page of the slides, as well as the fact that it was location of the cards before they were removed from the church, so it makes sense that its replacement should be in the same spot.

Creating Display Content

With the preliminary design done for the display, and a much better understanding of what the final product would look like, it was time to begin designing the navigation of the touchscreen, and determining content that would be contained within the system. There are two types of content contained on the display: the information extracted from the cards including images, names, dates, locations, and descriptions; and historical artifacts that may include text and images.

The most laborious task of the project was translating all of the cards into their digital forms in the database. At the beginning of the project, we were given a shoebox filled with all of the cards, 410 of them, that would all have to be digitized. At first, we believed that the best way to process these cards would be to scan them all in a reasonably systematic way. If they were all scanned in the same manner, then we could automate the task of translating the scanned photos into database entries using OCR technology. Within a few hours, we were able to scan all of the cards into PDFs, and the plan seemed to be going flawlessly. However, when it came time to translate the scanned photos into the database, we were met with some unexpected complications. First, the cards were not as uniform as we previously believed; many of the cards, maybe half, were uniquely designed from all of the rest. Second, the digital form of the scanned cards were not entirely uniform either, as some of the cards became skewed while inside the scanner. This meant that the scanned cards would have to be manually rotated before they could be processed by our automation. It quickly became clear that our automation

process would not be practical, and all of the digitized cards would have to be manually entered into the database. This process involved the manual cropping of every photo from each card, rotating it if necessary to prevent it from being skewed, then copying all of the text on the card into a form, always double or triple checking to ensure that there are no grammatical or spelling mistakes. With 410 of these cards, the total job took about a week and half of evenings spent translating all of these images into the database. While this was long and tedious work, it was the most important content for the display and the resulting content was very successful.



Figure 6: Meeting with Van Aroian at Armenian festival

It was important to us during the development of this project that we gain a better understanding of our client and its patrons, so one piece of content that we put into the display was interviews about two families that were important in the church's history. We met with two individuals, Van Aroian and Charles Der Kazarian, at the church's annual Armenian festival. **Figure 6** shows us talking with Van Aroian at the festival. The two shared with us their family's history, including fascinating stories about their lives during the genocide, how they came to Worcester, and all about their Armenian heritage. The notes taken during these meetings were

used to write a brief summary of the history of the Aroian and Kazarian families that would be included in the display to add some historical context. These two summaries are shown below:

Aroian Story

Van Aroian is the son of an immigrant who came to the United States in search of refuge from the Armenian genocide at the age of fifteen. He was born in the South End of Boston, and experienced a world that was ethnically and religiously Armenian. He speculates that the strong faith he saw in the community, specifically his mother, was a product of surviving the horrors of the genocide. However, a straight answer to this and many other questions was hard to come by. Most survivors remained silent on the issue of the genocide because their experiences were too painful to share.

Aroian moved to Worcester in 1959 to attend graduate school, where he found a strong Armenian community. He sought to become a teacher, and would go on to teach at Boston University, where he offered courses in Social Anthropology and Comparative Political Ideology. He also promoted the idea of Armenian studies, and eventually made a trip to Armenia, where he recalls conversations in the airports; crowds of people would ask newly arriving passengers, "Where are you from?" hoping to find friends and relatives from the same Armenian villages. Therein lies the tenacity of the Armenian people: their ability to seek out and help each other in the face of adversity.

Kazarian Story

Marian Der Kazarian, born April 5, 1909, is the 2nd youngest daughter of 8 children to a priest, Der Hayr Haroutune Der Harootunian, from Ashodavan, Armenia. Her father, and twenty-nine other family members, perished in the massacres and desert caravans that followed the night of April 24th, now known worldwide as *Armenian Martyrs' Day*. After being

forced to flee from her home, and experiencing numerous harrowing and tragic crises, she found her way to Worcester, MA with her mother, brothers, and sisters in 1921. Along the journey, she and her family repeatedly encountered situations where a turn of fate could have easily lead to their death: being rescued by Russian soldiers; jumping from freight trains to escape; and getting caught up in the Russian Revolution of 1917.

After settling down in Worcester, Marion became a very influential person at the Armenian Church of Our Saviour, getting very involved in church leadership, running a monthly newsletter, and compiling a history of the church for her book *Sacrifice and Redemption*.

The story of Marion and her family serves as a testimony in documenting the whole truth about the cataclysmic tragedy that befell the Armenian race. Furthermore, her family, including her five children Alma, Marion, Rose, Charles, and Peter, and her husband Garabed Der Kazarian, have been dedicated and influential members to the Armenian Church of Our Saviour. Their contributions to the history and success of this church are incalculable.

The final pieces of content that we wanted to include in the display was a variety of historical artifacts about the history of the church, the genocide, and the armenian people. Since this display would sit right next to the main entrance of the church, the addition of this content will allow the display to also serve as an interesting introduction to the church for visitors. In addition, viewers can go to this section to better understand the history of the people memorialized by the display. This section would include six artifacts, including the two interview summaries: a map of the events of the Armenian genocide; a brief history of The Armenian Church of Our Saviour; a brief, written history of the events of the Armenian genocide; and a copy of a quote by William Saroyan that is often recited by the Armenian people. These four pieces are shown in **Appendix A**.

Building the Display

The first step in building the display was identifying the physical materials that would run the software. After identifying which of the four designs would be used, described in **Appendix B**, we did this by balancing budget with our needs. There are two important pieces necessary to run the display, as well as a number of peripherals for mounting, cabling, and other necessities. A simple solution to this problem would be to purchase a pre-made POS-style touchscreen and computer. This solution had a number of problems that made us decide not to purchase an all-in-one display: the cost of the product was not over budget, but would have been significantly more than it could have been through other solutions; depending on which manufacturer this is bought from, there are a limited number of things that can be done with the display; and we had no prior experience working with such a product. Instead, we elected to build the system up ourselves from a much less expensive display by 3M, and a Raspberry PI computer to run it. The total cost including various cables and mounting systems came to \$224.28.

On the software side, the display was built as a website using Ruby on Rails as the package of choice for its design. We chose this method because: we had prior experience with the Rails package; ease of integration with the required backend for uploading new people; and platform independence for any future additions to the software. While source code for this software is not included in this paper due to size constraints, many details on it are described in the product manual shown in **Appendix C**. In addition to the Rails website, this display utilizes a number of open source projects. This display would not have been possible without the contributors behind these great software products including: Raspbian, matchbox window manager, matchbox keyboard, chromium, and countless others.

Display User Interface Design Considerations

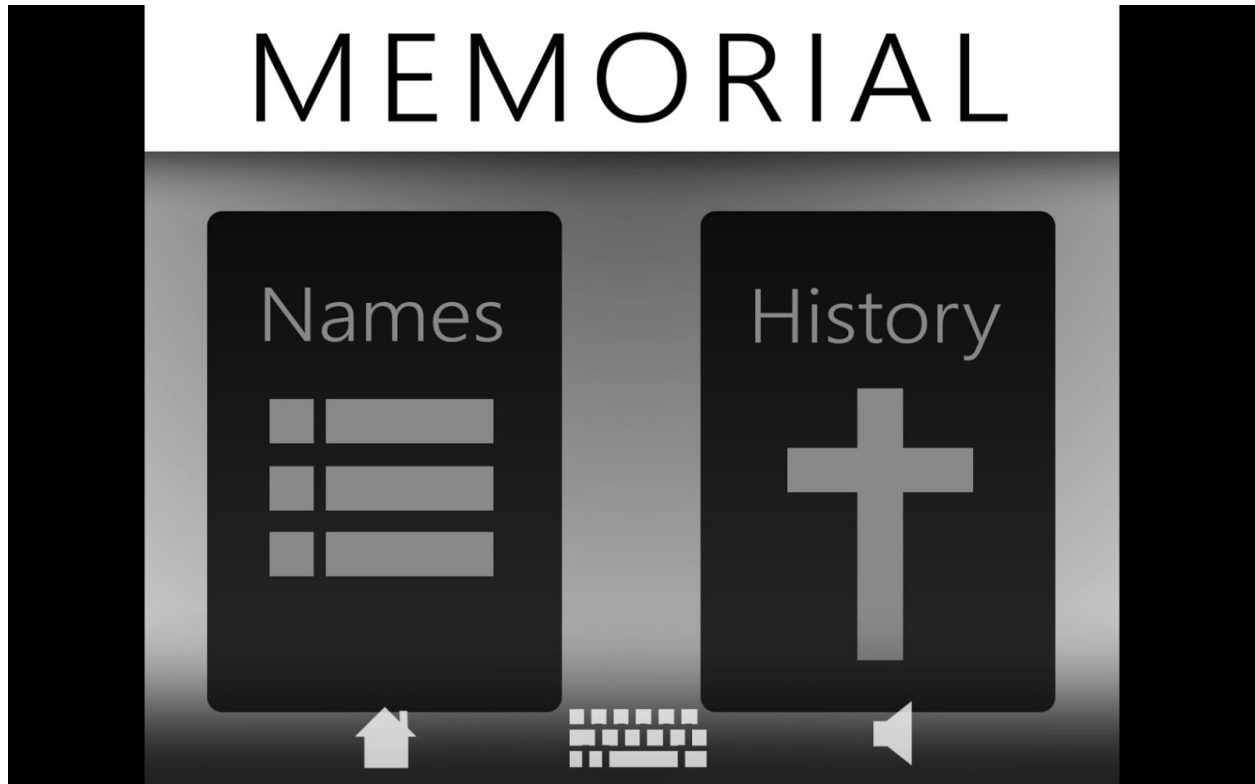
There were a number of factors that influenced the final design of the display's user interface. Creating a successful user experience was dependent on striking a balance between ease of use, hardware limitations, and the client's preferences. It was also important to keep the user base of the display in mind, as well as the display's surrounding environment. The design of the user interface went through several iterations before a finalized design was able to successfully make a compromise between these factors. The evolution of the design is as follows:

Iteration 1

After the first few meetings with the client, it was apparent that there was no predetermined style, nor were there any pre-existing guidelines to use as a basis for creating a user interface for the display. The first sample user interface was designed with a business feel in mind. The display would be hanging in the church foyer, and an over-the-top design would detract from the reverent atmosphere. It was also for this reason that the design did not incorporate sound elements. The client had mentioned that incorporating gentle music into the design was something they were in favor of. Incorporating sound effects, too, could add a powerful layer of feedback that can notify a user of a status change, or that a button has been pressed. However, using sound at all was discouraged in the design, as it could create unnecessary, or even obnoxious noise in a reverent area. This would especially be problematic whenever mass was being celebrated in the church.

This first iteration also established design concepts that all future iterations could build off of. For example, many of the users of the display would be elderly. This prompted the choice of large font text, and the use of easily readable, high contrast colors (e.g., black text on white backgrounds, or white text on black backgrounds). Also, the client anticipated elderly

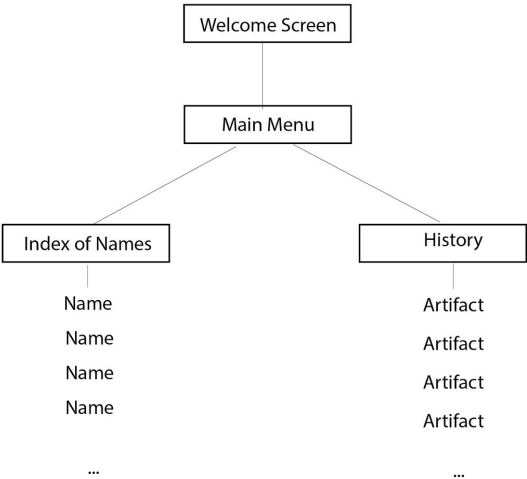
users would struggle to learn how to use the system. To mitigate this problem, basic instructions and cues were added to increase ease of use (e.g., “tap to begin,” “tap to view” tool tips).



The most important thing that the first iteration established was how the user navigates from page to page in the system. First, the user is presented with a welcome screen, which they must tap to begin, thus establishing the fact that the system has a touch screen based interface. This brings the user to the main menu. From the main menu, the user is given two choices: view the list of memorialized church members, or browse the artifacts of the history of the church and the Armenian people in general.

If the user selects the list of memorialized church members, he or she is brought to the complete list where he or she can browse it, or search for particular individuals. Tapping on any individual will give the user a larger picture of that individual and their pertinent information (e.g., name, date of birth, date of death). If the user selects the historical artifacts, he or she is

given a list of all of the artifacts, which can all be viewed with a tap. Also, the user may hit the back button at any time to return to the previous screen. If the system does not detect any user interaction for at least two minutes, the system automatically returns to the welcome screen.



Some elements of the first design did not stick. For example, although most of the graphics were black and white placeholders, the client strongly disliked having any flat colors or white space backgrounds. Future designs would also feature a simpler search function; instead of choosing how to search (e.g., by name, by location, etc.), the search function would search all data entries for the given input. Some other extraneous UI elements would also be removed (such as a volume/ mute button). Finally, a lot of the smooth motion graphics and transitions from page to page had to be removed for technical reasons.

Iteration 2

The second iteration of the user interface design built on the first design and incorporated feedback from the client. This included input on what images to use, as well as official wording for each page. At this stage, the design also had to be simplified to

accommodate the technical and hardware limitations of the system. A lot of the sleek features of the initial design proved to be impractical, and had to be replaced with simpler motion graphics.

Receiving official language from the client was very helpful to the design. Not only does using official language give the design an element of professionalism, but it also adds titles to each page in the system. Titles give the user a much better sense of orientation in the system; they let the user know where they are and where they've been. This increases ease of use, and makes the user's experience with the system more fluid. This is very important to the design, especially in this specific case, where the design must reduce the anticipated struggles of its elderly user base.

The client also proposed several pictures to use on the main pages. The integration of these images was a difficult design decision. The client intended the images be used as backgrounds, as a solution to the large amount of white space in the original design. The difficulty with using images as backgrounds is that it is difficult to read text off of them, especially with very busy images. Using digital image processing, it was possible to lighten the images enough to read black text off of. However, the result was often not aesthetically pleasing. Furthermore, the images were lower resolution than that of the monitor they were displayed on, and did not match the monitor's aspect ratio. When resized and cropped to fit, the images were often distorted, and felt incomplete. This made the images a target for change in future design iterations.

Church of Our Savior and Armenian History



While making revisions to the initial design, it was determined that the sleek motion graphics elements were too difficult to implement, and ultimately superfluous. This did not have much impact on most of the design. Moving from page to page would be a hard cut, instead of the original crossfade. However, the original format of the list of memorialized members was a long, continuous scrolling list, such as in a music library in an mp3 player. Due to technical limitations, the implementation of this feature was not feasible. The replacement for this feature was to list memorialized members on a series of pages. This design decision was difficult, as it was believed to lessen ease of use. The pages design did not take advantage of the touch screen's ability to scroll with touch, and made it more difficult to browse from beginning of the list to the end at the user's leisure; instead of a quick scroll, the user would

have to tap to advance pages many times. However, it was determined that the overwhelming majority of users would have someone in mind when browsing the list, and would thus use the search function, regardless of a scrolling list or pages format.

Iteration 3

The revisions made in the third iteration of the user interface design put a final polish on the previous design. The main goal of this iteration was to resolve the issue of white space while avoiding previous problems caused by using pictures as background images. The welcome screen also underwent an improvement to make it more dynamic and inviting. Furthermore, the pages containing the list of memorialized members, and the historical artifacts pages were optimally formatted. Finally, at this stage, the system was loaded into a Linux based operating system, whose own user interface elements broke up white space further.

When considering how to break up white space, design considerations were biased towards the client's request for image backgrounds. However, this had proven impractical on pages with a lot of text. Thus, only a handful of the main pages were chosen to have picture backgrounds: The welcome screen, the main menu, and the historical artifacts menu. These pages were accepting of image backgrounds because most or all of the text was on buttons or other area that was easy to read off of. Pages with lots of text and white space, such as the individual historical artifacts pages, were given an original graphic made with text readability in mind as a background to break up the white space.

In the case of the welcome screen, the client had a specific image proposed to use as a background image. However, one static image was determined to be too bland and uninviting. As a remedy, the welcome screen became a scrolling slide show of several images. This allowed for the incorporation of images the client wished to include in the design, but which did not fit

in their intended place. Fortunately, this allowed for the inclusion of the client's input, while maintaining the integrity of other parts of the design.

Initially, the pages listing the memorialized members were supposed to have picture backgrounds. However, as these pages were text heavy and used a relatively small font, and could not be read clearly off of a complex image. This issue was resolved with optimized formatting. Originally, the design called for a scrolling list made up of one column. However, when the switch to a page layout was made, restricting the design to only one column no longer made sense. By adding a second column, not only did the number of results viewable per page double, but the entire screen itself filled up with results, effectively eliminating unnecessary empty space.

Similarly, the individual historical artifact pages were originally planned to have an image as a background. Text formatting and accompanying imagery were able to break up empty space on these pages, but was occasionally insufficient. In order to further break up this empty space, an original graphic was created with readability in mind. It was a mostly white image, with a light gray design. This made the background more interesting to look at, but did not distract from the main focus of the page: the text.



The final step in the design plan was to load all of the design elements into the system, which ran a Linux based operating system. This operating system came with its own “framing” to each page and interactive element in the system. This framing brought the entire design together even further, and made it look professional. This final build underwent some preliminary testing, and performed well, as it appeared to be easy to use and received positive feedback with regards to the aesthetics of the design.



Conclusion

This project began with a shoebox full of paper cards and little idea of what the end product would look like. We digitized all of those cards, transposed them all into a database for easy searching and viewing, designed and proposed a solution to the problem, identified and purchased exactly the necessary technology for the product, created a visually intriguing interface for interacting with the database, gathered stories and history from the church and its people, and built an extensible software solution to mirror the designed interface and provide a product that could be enjoyed by the church for years to come. This whole process involved late nights, many meetings, and a number of bumps along the way. Looking at where we started in the beginning of A-Term, we are very happy with the result of this project and proud of the product we have built.

In the last two terms, we have learned a lot during the construction of this device. In addition to valuable experience working as team on technical solutions, we have also, and perhaps more importantly, gained incredible insight into one of the most interesting group of people in the world. The Armenian people are one rich with history, culture, and tradition. The opportunity to work closely with people from the church, especially to interview some of its most influential members, was our most valuable learning experience. It is one thing to read about the Armenian people and the Armenian Genocide in a history book, but to actually meet these people and hear their stories is the only way to ever realize their incredible tenacity, strength, and history. Working with The Armenian Church of Our Saviour has been a great experience and we thank them for their support in the completion of this important project.

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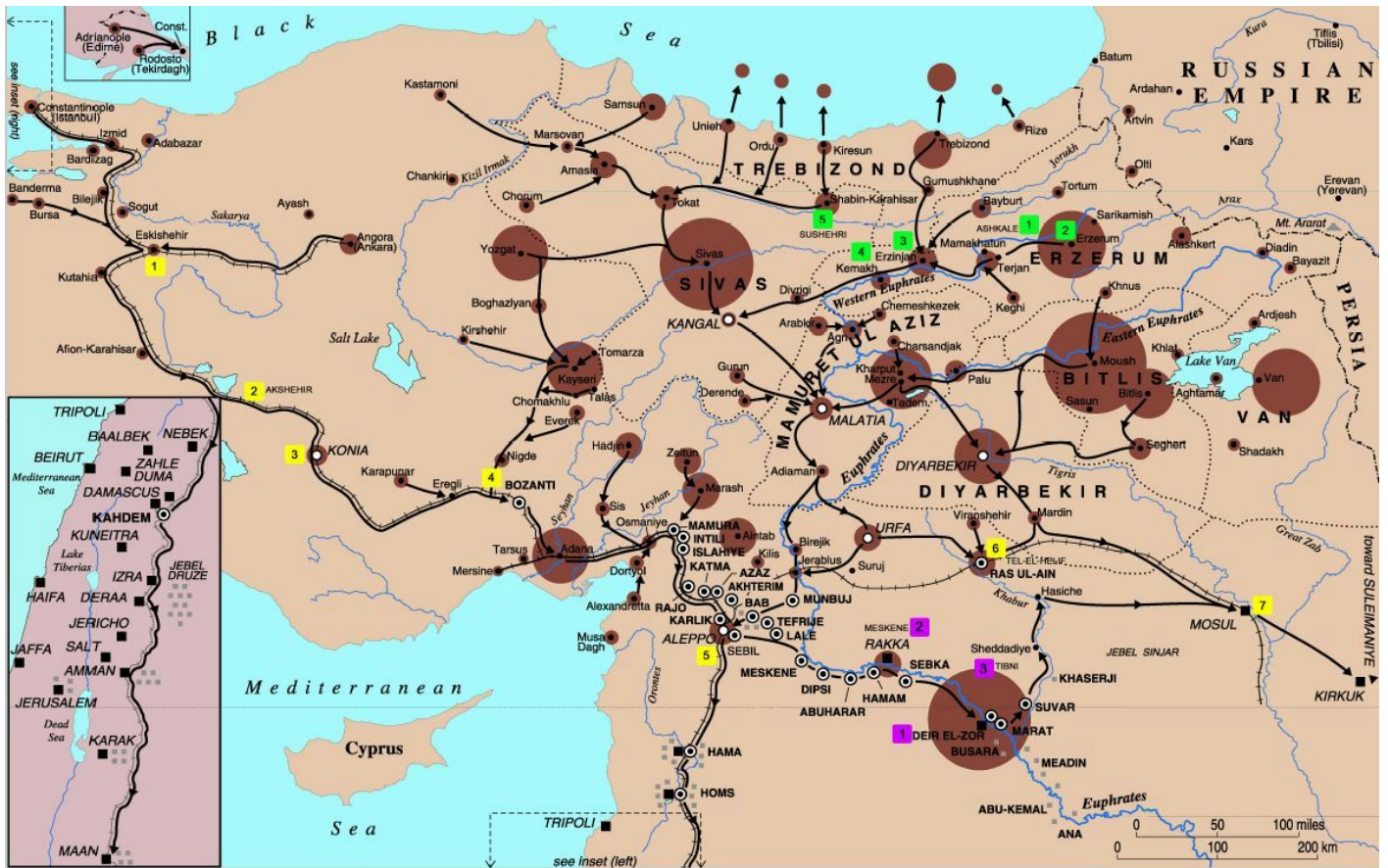
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Appendix A

Preliminary schedule made following first IQP meeting:

Task	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14
	Aug-30-Sep-3	Sep-6-Sep-12	Sep-13-Sep-19	Sep-20-Sep-26	Sep-27-Oct-3	Oct-4-Oct-10	Oct-11-Oct-17	Oct-25-Oct-31	Nov-8-Nov-14	Nov-15-Nov-21	Nov-22-Nov-28	Nov-29-Dec-5	Dec-6-Dec-12	Dec-13-Dec-19
Meet with Dean Oates/ Define project														
Meet with advisors about design/history														
Write Background section														
Write proposals for design														
Meet with advisors to propose design														
Build the system														
Write the methodology chapter														
Write the introduction chapter														
Presentation preparation														

Map of the events of the Armenian Genocide:



A brief history of The Armenian Church of Our Saviour:

Church of Our Savior is an Armenian Apostolic church in Worcester, Massachusetts, known for being the first Armenian church in the Western hemisphere. The church was built in 1891. Armenians from throughout the Northeastern United States contributed with money to erect the first Armenian church in the area and in the country. The original church building was demolished and rebuilt in its current form later, in 1952.

During its construction, the original church became an important center for all Armenians and local Americans alike, as it became a symbol of cultural change. "The construction of the small church gave the Armenians of Worcester a measure of respect from the larger community not previously given." To this day, it has remained as an institution of culture and history as a home to thousands of Armenians in the Worcester area.

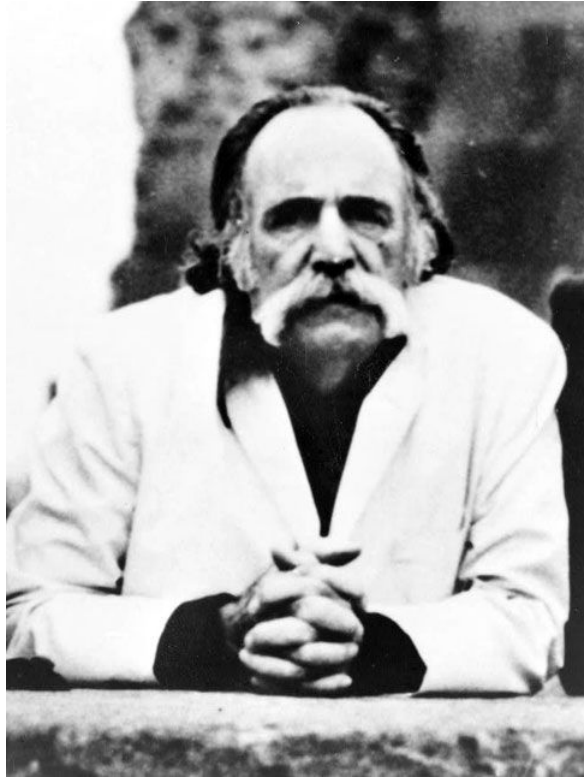
A brief history of the Armenian Genocide:

The word "genocide" did not exist in the early 20th century when over 1.5 million indigenous Armenians were brutally murdered on the land they had occupied for over 3,000 years at the hands of the Ottoman Turks. Raphael Lemkin was explicitly moved by the Armenian annihilation to coin the word genocide in 1943 and define systematic and premeditated exterminations within legal parameters. It is acknowledged as one of the first modern genocides, because of the organized manner in which the killings were carried out to eliminate Armenians. It is the second most studied genocide after the Holocaust.

The architects of the Armenian Genocide were leaders of the young Turk Party. On the night of the 23-24 April 1915, known as Red Sunday, the Ottoman government rounded up and imprisoned an estimated 250 Armenian intellectuals and community leaders of the Ottoman capital Constantinople who were moved to 2 holding centers near Ankara. They were then gathered into the square and executed by hanging. The Armenians commemorate the Genocide annually on April 24. Van Dadrian wrote the 80,000 Armenians 90 villages across the Mus plain were burned in stables and haylofts and he estimated 50,000 Armenians were killed by drowning in the Trabzon province, where the Italian consul of Trabzon in 1915 wrote: "I saw thousands of innocent women and children placed in boats that were capsized in the Black Sea."

"Who today remembers the Armenians?" was Hitler's response to his generals in 1939 when they questioned his invasion of Poland. The atrocities of the Holocaust eerily mirror the events of its predecessor, the Armenian Genocide. Many Americans spoke out against the genocide, including president Theodore Roosevelt, Rabbi Stephen Wise, Alice Stone Blackwell, and William Jennings Bryan, U.S. Secretary of State in 1915. Germany, Turkey's ally in World War I, has officially recognized the Armenian Genocide. Many European countries have followed as well as Canada and others worldwide. Israel and the United States still have not. 100 years later, the Turkish government continues to deny the Genocide. They assert the murder of over 75% of the world's Armenians was the result of WWI.

William Saroyan quote:

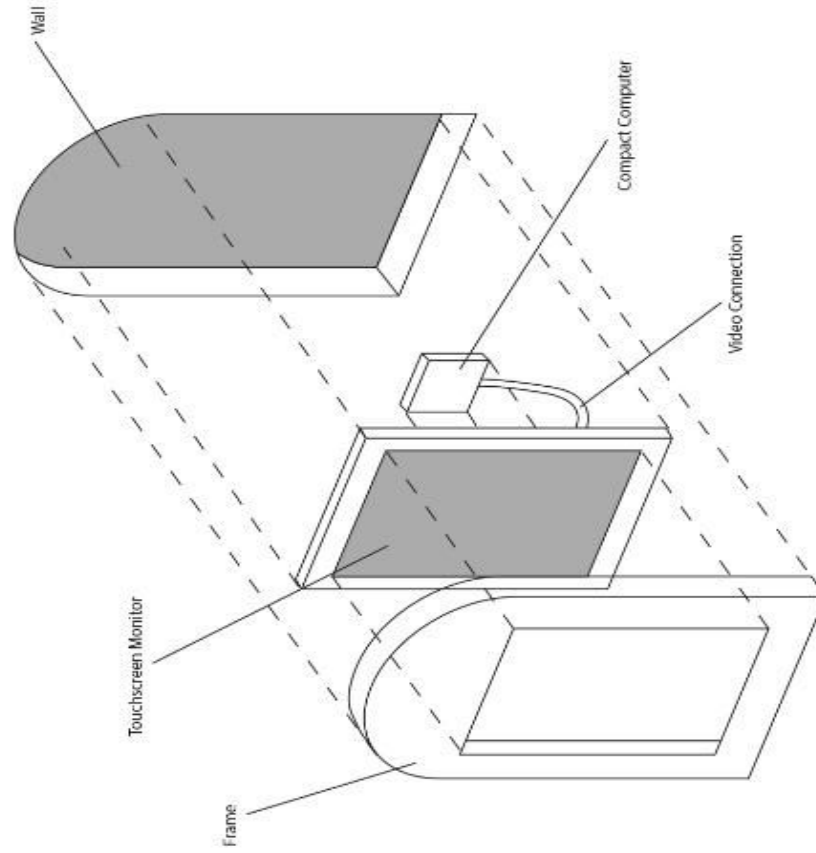


"I should like to see any power of the world destroy this race, this small tribe of unimportant people, whose wars have all been fought and lost, whose structures have crumbled, literature is unread, music is unheard, and prayers are no more answered. Go ahead, destroy Armenia . See if you can do it. Send them into the desert without bread or water. Burn their homes and churches. Then see if they will not laugh, sing and pray again. For when two of them meet anywhere in the world, see if they will not create a New Armenia."

-William Saroyan

Design 1

- Touch-interaction display built into wall
- Located in the wall next to front doors of the church
- Dedicated system for displaying the memorials
- Surrounded by wood veneer/ case



Design 1

Pros

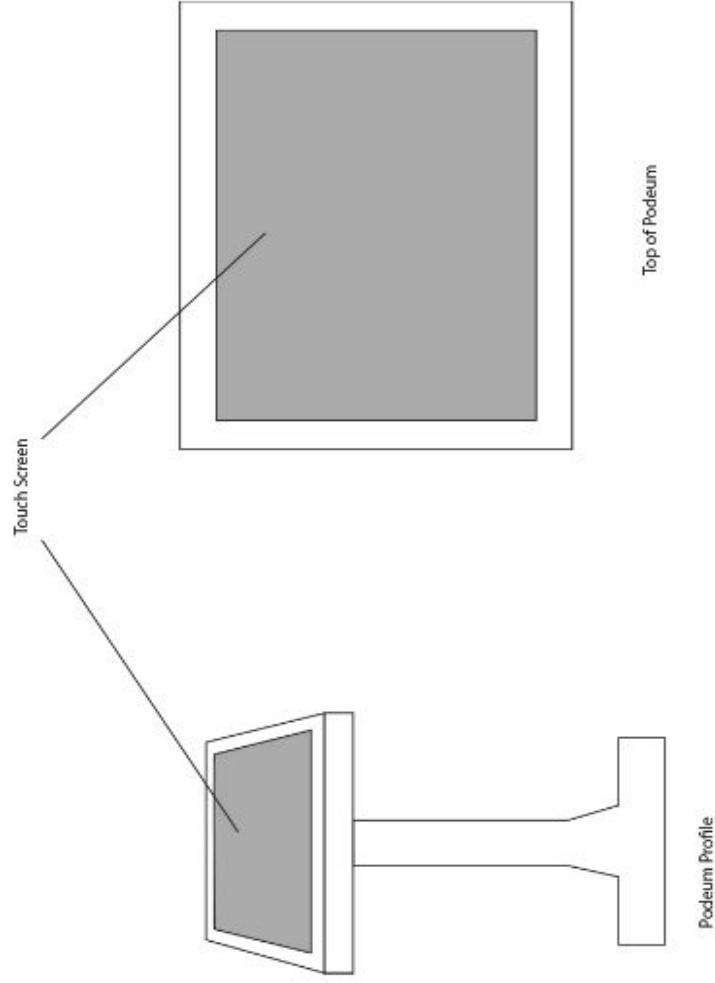
- Elegant, eye-catching solution
- Slim chance of anybody breaking it.
- Fairly cheap to make
- Natural spot already located with wiring in place
- The cards used to be there...

Cons

- Possibly less useful for calendar/announcements
- Unadjustable height, non-mobile. Height a concern for children to reach?
- Difficult for multiple people to use at once?

Design 2

- A larger, wooden stand with a touch display in the top
- Think a slimmed-down podium
- Probably just displays memorials



Design 2

Pros

- Designed to stay in one spot, but mobile with relative ease
- Unlikely to be broken (large construction could not be knocked over)
- Fairly cheap to make
- Could have built in step ladder for use by kids

Cons

- Probably not useful for calendar/announcements
- Might be a bit of an eyesore? A large podium is not exactly elegant
- Difficult for multiple people to use at once?

Other Options...

Ipad-Style displays on music stands:

- Mobile,height adjustable, but easily knocked over and breakable
- Probably good for announcements/calendar and memorial records
- Relatively cheap
- Could easily have multiple
- Wires might get in the way?

Large TV-style display with limited interaction

- Very ideal for announcements/calendar.
- Not so ideal for interaction-oriented memorial system
- Very little space for the display, immobile
- Many people can look at once
- Ideal for stated uses at weddings/funerals, etc.

Appendix C

Memorial Display Manual

for Armenian Church of Our Saviour

Using the Display

Use of the device is very simple. After the device has booted, it will show a welcome a screen:

- Tap anywhere on the screen to start using the display.
- From the main menu, tap either of the navigation buttons to go to that section
- In the “Church of Our Saviour and Armenian History” section, tap any of the squares to view the described artifact, or use the back button to go to the main menu
- In the “Legacy Church Members” section:
 - o Use the buttons at the bottom of the page to navigate to the next or previous pages of people
 - o Tap on the search box in the top right to search by name or place, which will bring up a simple on-screen keyboard.
 - o Tap on the back button to go back to the Main Menu
 - o Tap on any person shown on screen to show his picture and information in a larger window.
 - § To close the window, tap anywhere outside of the enlarged view.
- Inactivity for ~2.5 minutes will redirect the user back to welcome screen, assuming that the user has walked away.

Using the Admin page (Adding people)

Use of the Admin page is also very simple. In order to access this page, the device must be running:

- Using any laptop or computer connected to the Armenian Church of Our Saviour's network, navigate to the website "http://memorialdisplay/admin" (without the quotes).
- If the website is not accessible, give it a minute or two to load. If it never loads, try restarting the display device. Note that if the configuration of the Wifi within the church has changed, the settings on the device will have to be updated as described in the maintenance section below.
- Use the username "admin" and password "acoos2015" (without the quotes) to login to the admin form.
- A page will be shown containing every person in the database, with the newest entries shown at the bottom. You can use this list to Edit or Delete entries from the database.
- Add a new person to the database by clicking the "+ New Person" button at the top left of the page.
- Fill in the form on this page with all desired information. If you do not have information for one of the boxes, leave it empty. While formatting the photos is not *necessary*, it is highly recommended that the photos be in a portrait orientation, with reasonable resolution, and less than 10 Mb in file size. The steps for fulfilling those requirements are different on every computer, so someone who knows how to edit photos may have to do this for you.
- Click submit to add the person to the database, where it will be shown at the bottom of the admin page and in alphabetical order on the display.

Maintenance

For the vast majority of problems, simply restart the display and check again that it is working.

Restarting the system should work for every problem that is not outlined below. Note the following solutions should only be carried out after trying the restart solution, and should probably be done by someone with Linux and Wifi topology experience.

Problem: Cannot connect to the admin panel at “<http://memorialdisplay/admin>”.

1. Ensure that you give the website plenty of time to load, as it may be slow
2. Ensure that username/password is being typed correctly.
3. If completely inaccessible, it may be because the Wifi settings within the church have changed, and the device can no longer connect to the internet. Take the following steps to reconnect the device to the Wifi:
 - a. Ensure that the Wifi settings on the router are setup to make the device accessible via the “memorialdisplay” name. Do this by adding a DHCP rule that matches the name “memorialdisplay” to the address 74:DA:38:0E:28:C5, which is the hardware address of the Wifi card on the Raspberry Pi computer. Depending on the router software, it may also require assigning a static IP in the DHCP settings.
 - b. If the Wifi SSID, or password, or router has changed, the Raspberry Pi will also have to be reconfigured to connect to the new router settings:
 - i. Connect a USB keyboard to the booted Raspberry Pi in one of its unoccupied USB slots.
 - ii. Open the console window by pressing Ctrl+Alt+F1.

iii. Log in to the device using the username “pi” and password “acoos2015”.

iv. Type “wpa_gui” into the console and press enter to start the Wifi configuration tool, then press Ctrl+Alt+F7 to return from the console and view the tool.

v. Use this configuration menu to reconnect to the new Wifi settings, ensuring you save the configuration so that it will reconnect at its next bootup.

vi. Restart the device

c. If steps “a” and “b” are completely done correctly, and the website is still inaccessible, it may be because the computer that you are trying to access the website on is not connected to the church’s network. Check the wireless settings on your laptop or computer to ensure that you are connected to the same Wifi network.

Problem: The Raspberry Pi will not boot, or gives an error while booting

1. The most likely problem, especially if it has been a couple of years, is that SD card in the Raspberry Pi has failed. Take the following steps to replace it:

- a. Buy a new “Micro SD Card” which should be at least 32 gigabytes in size.
- b. Follow the steps shown in Backup Info section to initialize the new SD Card with the newest database version

2. It could also be that the Raspberry Pi itself has failed. This will be the likely candidate if the device starts to boot, but never shows any errors or dialog. This means its CPU has failed.

- a. Buy a new Raspberry Pi, the original type used for this project was a

Raspberry Pi 2 Model B, so you should probably get the same one if you want to avoid errors when using the same SD card.

b. Unplug everything from the old Raspberry Pi, remove it from the clear case, then replace with new Raspberry Pi, ensuring everything is plugged back in.

Problem: The touchscreen does not work

1. Turn off the device, then check all cables to ensure none have come unplugged or are loose. Just unplug them and plug them back in securely to be sure.
2. If all cables are fine, the touchscreen may have failed. If you are certain this is the problem, a new one can be purchased from 3M, the company that made the original. The original product was the “3M C1710PS 17" CCFL LCD Touchscreen Monitor”. This is part number “98-0003-4097-0” from the 3M website.

Problem: Nothing is shown when powered on, and no lights on the Raspberry Pi turn on

1. There is likely a problem with the power supplied to the Raspberry Pi.
 - a. Check all cables to ensure they are securely connected
 - b. Ensure the power outlet is still functional
 - c. Replace cords and devices as necessary

Backup Info

To prevent loss of data in the case of a hardware failure, changes to the database are automatically pushed to a backup hosted by MEGA. These backups are fully automated, and should not have to be dealt with except in the case that hardware has failed on the Raspberry Pi. Take the following steps to initialize a new SD Card so that it can be used with the system:

1. Partition the Micro SD Card as FAT32.

2. Download an image for the device. The image is available at the following link, which will require the key “!cmo9GAn8G8DDw8imhzNOXRSzj7otoRCnKjB2O95I-Jk”:
<https://mega.nz/#!fdRlnQQK>
3. Click “Download Via Browser to download the file”
4. Flash the image onto the Micro SD Card using Win32DiskImager or similar software
5. Insert the Micro SD Card into the Raspberry Pi
6. Turn on the system and wait for it to boot to the welcome screen
7. IMPORTANT: Do not edit any of the individuals in the admin panel before completing the following steps, as doing so would overwrite the backups on MEGA servers.
8. Ensure that the device is connected to the Wifi so it can download the backups. One way to do so is by trying to access its admin panel from another computer.
9. Either SSH into the device with username “pi” and password “acoos2015” or:
 - Connect a keyboard to one of the available USB ports on the Raspberry Pi
 - Press Ctrl+Alt+F1 to access a virtual terminal
 - Login with username “pi” and password “acoos2015”
10. Run the command “sudo raspi-config”, which will display a GUI of Raspberry Pi options.
11. From this list, select “Expand Filesystem”, which will allow the flashed image to fill the Micro SD card. The device may need to be rebooted before continuing. Reconnect to the device in the same way after this is done.
12. Navigate to /home/pi (should be the default directory after logging in)
13. Run the command “./syncBackups” to download backups from the MEGA server
14. Allow the process to finish, then reboot the device.
15. Ensure that backups have been loaded into the database before making further changes to it.