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Assessment: Creative exploration and prototyping project

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Declaration: We have read the University of Limerick plagiarism policy and procedures and we declare that this report/project is our own original work.

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1. Introducing and framing of our design intervention

Our design intervention is a Mixed Reality App that aims to teach embroidery to users who are new to embroidery or those looking for a new hobby. Embroidery is a craft which has existed in some form or the other in cultures worldwide for generations. It involves using a needle to apply thread or yarn. There are different varieties of hand embroidery stitches, most of which cannot be replicated by a machine. Learning various types of stitches and mastering embroidery can be quite intimidating.

Our system is designed as a game which would take the user from beginner to intermediate level. The system consists of an Augmented Reality Microsoft Hololens 2 application and a companion iPad application. Hololens app will guide the user in doing stitches by augmenting designs on the fabric. The Apple iPad app will allow the user to draw their design using Apple Pencil.

2. The use of creative tools

2.1 Brainstorming

We started our design process with rapid brainstorming sessions. Due to the ongoing COVID pandemic, we did the brainstorming sessions online. We had three 15minute sessions in two days, where each of us in the group was asked to come up with as many topics of interest as we can. We used a collaborative kanban board app called Notion for doing this. We explored topics ranging from our day-to-day life activities to problems faced by people facing various chronic illnesses. We made the duration of each session short to maximise our efficiency. After the three sessions, we again sat together online and weighed out different topics by voting for the best ones. The metrics which we used were the constraints which we have- like possible challenges we might face in research by the ongoing pandemic, the deadline for submission and a few more. After this shortlisting process, we again split up, and we did some basic research on each topic.

Areas of interest:

2.1.1 Waste Management

The topic of waste management arose from a discussion and brainstorming that started with environmental sensitivity, carbon footprint and global warming and aspects of personal responsibility towards the planet. The topic of waste generation and management were of natural concern and sparked a debate amongst group members. The aspect of personal responsibility or accountability of an individual contributor of waste or garbage was taken as the direction for discussion. There were several discussions based on the mind mapping (fig --) done, and the idea that seemed interesting was that of a smart dustbin. The discussion yielded a few sketches that helped to spark ideas and encouraged further discussion amongst group members. On further discussion, it was generally agreed upon to work towards an interactive, smart dustbin model. One that would probably have a screen-based interaction and used Artificial Intelligence and Machine Learning to sort and segregate the kind of garbage or waste dumped into the dustbin. The screen would also display the environmental impact of the waste disposed of, including the recyclability, energy consumed to recycle and so forth. However, on further discussion and discussion, it was learned to be unfeasible in terms of implementation, costs etc. The environmental impact the interactive dustbin model or prototype would make was a major drawback and the group members felt it was ironical.

2.1.2 Last wish.

Death is a sensitive subject to many, and we tend to avoid the discussions about it. Awkwardness, embarrassment and fear mean we tend to shy away from connecting with those who are dying or those who are grieving. Safeguarding a person's memories and their last wishes are clear and accessible to their loved ones might be a space we could explore. Some of the key questions we could address about this include:

- Organ donation preferences. Organ donation can save lives, but there are incidences of murder where a donor who had signed up for
- Who should be the legal heir, how his wealth will be divided?
- Method of final deposition?
- Send a message to the loved ones?

2.1.3 Fitness.

The COVID-19 pandemic was a nail in the coffin for people trying to keep fit or on a journey towards fitness. The forced lockdowns and shutdowns meant people had a hard time keeping to their fitness plans and schedules. While brainstorming various ideas and scenarios a concept for an Interactive Fitness program based on a large touch screen was put forward for discussion.The idea was to use a large interactive screen and a companion Fitness app for gym users. Taking into consideration the COVID-19 situation, social distancing was a main theme that drove the discussion. The idea of the interactive screen was thought out as a guide to users for workouts and exercises.The entire system was to be monitored by the respective personal trainers of each user.The system would include step by step video demos or interactive demos that would aid the user in posture correction, choosing the right exercises and

gym equipment and so forth.On further discussion it was learnt that the number of gym users were limited amongst peers and the viability of the project was debatable.

2.1.4 Loneliness among elderly

Loneliness can be defined as a lack of communication or connection with fellow human beings. It can occur to anyone, anywhere and is not specific to any particular age group in particular.Having said that it does have a bigger impact on the elderly, especially if they are living alone. The advancement of age and the weakening of motor and cognitive skills along with loneliness can be a recipe for disaster if left unattended. The context for this topic came up while brainstorming about mental health and wellbeing and the associated stigma these topics have in society as well as the prevalence of loneliness amongst the elderly.Thie discussion was also informed by the interactions of a group member with their landlord.There was a general consensus on the relevance of the subject and it also resonated particularly well with all the group members. The concept of using an app based solution for helping the lederly with loneliness was debated and deliberated upon. However, there was a general disagreement about this approach and it was decided to explore other venues and ideas.

2.1.5 Hobbies and soft skills

A hobby is an activity that a person engages in for leisure or enjoyment. Various researches [6] have revealed that a hobby can ease the effect of depression, dementia, stress and lead to an overall improvement in the mental health and wellbeing of a person. We brainstormed and discussed various ideas and methods that would allow a person to pick up a new hobby or to learn and nurture a new skill. We discussed several ideas about screen based and physical products that would help a person to get acquainted with a new hobby. This discussion led us to the topic of hand embroidery and a few related arts and crafts .Hand embroidery, however, was widely discussed and agreed upon as a topic for further exploration amongst group members. It was mainly due to the fact that embroidery as an activity had the right mixture of fun and learning and it involves both motor and cognitive skills. Besides this,a few group members also had previous experience practicing handicrafts and embroidery as well. In order to explore hand embroidery in a detailed manner, we created a mind-map.This helped us to explore and understand the various interactive aspects and the possibilities associated with embroidery as well as limitations, constraints and possible pathways.

3. Exploration of the design space and selection of the prototype design

The main exploration of the topic hand embroidery or simply embroidery stemmed from the mind mapping that was carried out by the group members. A few exploratory sketches as well aided us to better understand the topic,its constraints and possibilities. The initial brainstorming and sketching exercises helped us align as a group towards a certain design direction. The concept of using Augmented reality/mixed reality as a means to help with the learning process was again an outcome of the discussions and brainstorming sessions and was seen as the right balance between new technology and basic human skills. The technology was not overpowering or undermining human skill but only being used as a tool to enhance or empower the user to learn and get acquainted with a new skill. This approach was quite an important step for us and this became the basis for exploring further outcomes in terms of prototypes, sketches and so forth.

3.1 Learning pathway

As per our research, a person should know the basic 12 stitches in order to learn hand embroidery as a beginner or advanced learner. If they master these 12 stitches, they are ready to tackle or build their designs on their way to any embroidery project.

Various education research [5] demonstrates that gamified learning is incredibly effective. Gamifying education increases student motivation, expands student curiosity and it provides real-world practice in the chosen subject.

We added levels in our interaction design to make the learning enjoyable. Human nature makes us take the challenges and prove that we are able to handle them. Introducing levels is a way of challenging the user. Users will only be allowed to unlock an exercise if they completed the previous ones. We might have to do further research and user testing on categorizing the levels. Each level is segregated into four exercises. All the exercises of a particular level would be of the same difficulty level. Each exercise would teach the user a particular type of stitching. The next exercise will be unlocked automatically when the user completes one exercise.

We designed a learning pathway in such a way that, once they complete the twelve stitching exercises, they will reach level 5. At level 5, they can use their own designs for embroidery. This is one of the rewards in the gamification experience. They can either draw the designs on an iPad using their hand or by using an Apple Pencil. For performing this, we provided an editor screen that would allow them to draw designs. Inside the editor they can draw the designs using brushes.

The overview of all stitches is as below:

3.1.1 Level 1

3.1.1.1 Running Stitch

In embroidery, the running stitch is the fundamental stitch on which all other types of stitching are based. The stitch is worked at an average distance by passing the needle through and out of the thread.

3.1.1.2 Back Stitch

In Backstitch, stitches are rendered backwards in the general stitching direction. They are most commonly used to outline shapes and to add fine detail to an embroidered portrait. It is used to embroider lettering as well. It is one of the most robust stitches amongst simple stitches.

3.1.1.3 Outline stitch

Outline stitch is somewhat similar to stem stitch, and is also known as thread up stem stitch. In embroidery it is used to give an outline to the designs.

3.1.1.4 Chain Stitch

It is a technique in which a sequence of looped stitches create a chain-like pattern. By bringing the thread around the needle as you make a stitch, the chain stitch chains are formed. The loop of a thread, each anchoring the previous one in place goes around the stitch coming after it.

3.1.2 Level 2

3.1.2.1 Herringbone Stitch

A kind of cross-stitch in embroidery similar to the sewing grab stitch, consisting of an alternating V-shaped stitch that induces a twill-weave look when executed in a continuous pattern. It is identical to the bones branching from a herring fish's back, so it is called the Herringbone.

3.1.2.2 Blanket Stitch

One of the most versatile embroidery stitches that beginners can master is the blanket stitch. It may be attached to the edge of a hem, employed as a surface embroidery, used as a decorative frame or border, or on an embroidery project to connect other elements in place. It can also be used around the edges of cloth as a polish.

3.1.2.3 Cross Stitch

In hand embroidery, cross stitch is the most popular stitch in which an image is created using X-shaped stitches in a tiled, raster-like pattern.

3.1.2.4 Feather stitch

A vine-like line that is made up of linked open chain stitches is formed by the feather stitch used in hand embroidery.

3.1.3 Level 3

3.1.3.1 Satin Stitch

A satin stitch in embroidery is a collection of flat stitches which are used to cover a portion of the background cloth entirely as per the design of the user.

3.1.3.2 Lazy Daisy

The lazy daisy is also used to have tiny floral patterns and petal designs. It is composed of a single chain loop instead of a continuous pattern. It is one of the stitches that is incredibly simple. It is not appropriate to restrict this stitch to only petals and leaves, but it can also be used for more complex designs

3.1.3.3 French Knot

French knot stitch is very useful for little bits of texture that can be added to any embroidery design. A basic embroidery stitch that produces a sweet little three-dimensional bump is the French knot. They make outstanding animal eyes, decorative points, and flower centers by themselves. A French knot, grouped together, provides a beautifully nubby texture that can be used in a multitude of imaginative ways.

3.1.3.4 Woven Spider Wheel.

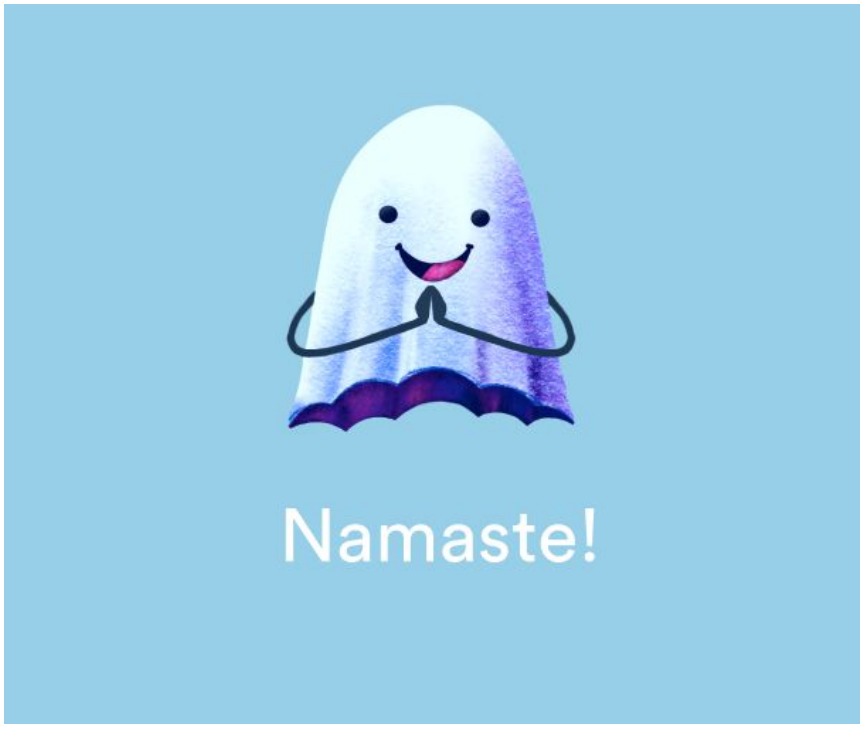
The final outcome of the Woven Spider Wheel is similar to the spider web, So it is called a woven spider wheel.

3.1.4 Level 4

Users can explore their own style after learning all of these stitches. We build the exercise in such a pattern that a person uses all the stitches he has mastered from all the levels so far. Either he can draw his own template for the exercise one in Level 4 or he can take the designs already submitted to the app.If he unlocks exercise two he can design his/her design from a picture for example he can pick any scenic beauty or portrait. We have provided the option of mixing and matching. He can mix and match different stitching techniques or design in exercise 3, to explore the user's imagination. When doing all this exercise, users can go back and practice the stitches at any time.

3.2 Mascot

For providing a great learning experience for the user, effective communication between users and the system is very important. To make the communication more effective and human centered we tried to incorporate a mascot. Mascot is a personified image or a character, that a will symbolically represent the brand. We explored different options, like birds, animal figures and so on. We wanted a gender neutral and inclusive mascot, so it will be relevant to a wider audience and thus to include as many people as possible. We researched learning apps which effectively use a mascot to communicate with the users. We used ProCreate App on iPad to draw the mascot character.



4. Userflow

A user flow will start with an entry point where the user will access the product initially. Then there will be a series of steps and a final step completing the intended task. Arrows will be used to connect each component. We started the process by creating a rough outline. The initial conversations we had with some users who practice hand embroidery helped us to identify the components. It helped us identify the objectives and different tasks involved. We created a rough draft, just like a mind map where each component denoted a step in user action. We created the initial user flows on paper, and we went through multiple stages of refinement. We tried to visualise all the interactions a user can do within our app in the user-flow diagram. We spent a considerable amount of time designing the flows, and we repeated the process over and over again until we finalised a version that we could use to start wireframing. User flow diagrams helped us to polish the changes at a low fidelity before investing much time in design. We used user flow diagrams as a storyboard for the use-cases of the product.

The primary user flows in our game were:

4.1 User onboarding

User onboarding involves how a new user is introduced to our system. We had to decide whether we should make them register to the app using their email/phone, or should we allow them to use the application without registering. For saving the progress of the user in the app,

there should be an option to create an account. Otherwise, their progress will be lost when they return to the app. So we needed a user registration and sign-in process.

4.2 Game logic

In order to implement the curriculum, we decided to implement some game logic where the user will progress within the app on various levels. The difficulty level increases with each level. We also believe that having various levels would improve the overall learning experience. Instead of overwhelming the user with all the exercises at once, they will have to complete steps one by one. However, we believe that there is room for improvement there. We will have to do more user tests and then improvise the logic by which we deliver content.

4.3 Creating embroidery on fabric

We will use the Hololens app to augment the marker on the fabric. After the user wears the Hololens, they can either select the designs to be embroidered or select the next exercise. Hololens will then calibrate the environment to augment the designs on fabric. There will be green and red dots augmented on the fabric, which will correspond to the needle-in and needle-out positions.

4.4 Creating custom designs for embroidery

Many see embroidery as a hobby and pastime. Most of the users we talked to during the initial research, wanted to stitch their hand-drawn designs on the fabric. For creating a custom design, they can either upload an image or draw the design using Apple pencil. For creating designs from an image, we can use image processing techniques to create outlined images from raw images.

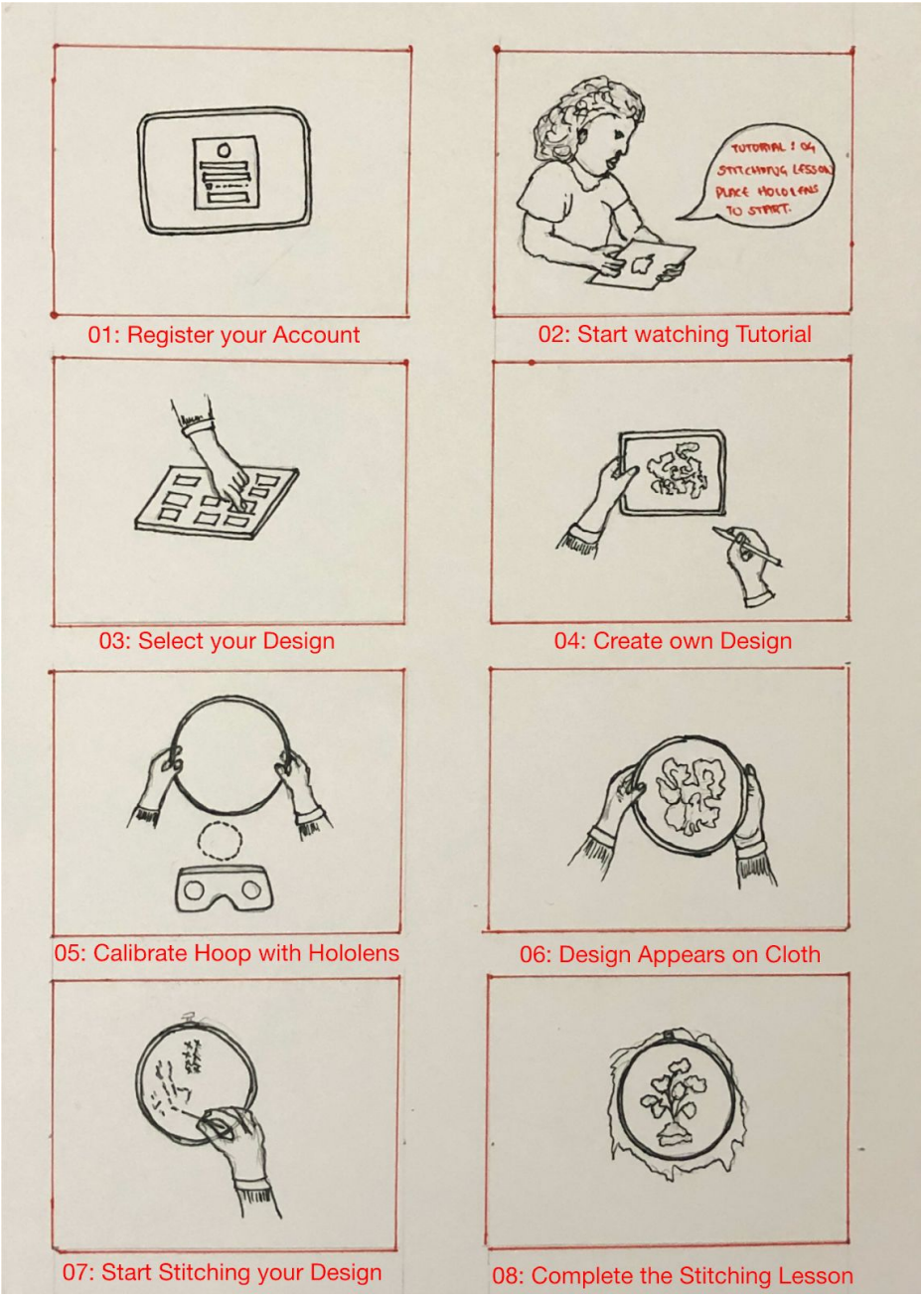
4.5 Tutorials

Within the app, users will be able to watch embroidery tutorial videos and read about various embroidery principles. In the future, we also plan to explore the possibility of building a community of embroidery enthusiasts where they can share photos and designs.

4.6 Settings

Users will be given various options like to change their email/phone number, manage notifications and manage their designs.

In each of the above flows, we identified the stage, primary actors, collaborators and data-sets involved.


TUTORIAL ! OF STITCHING LESSON PLACE HOLOLENS TO START.
01: Register your Account
02: Start watching Tutorial
03: Select your Design
04: Create own Design
05: Calibrate Hoop with Hololens
06: Design Appears on Cloth
07: Start Stitching your Design
08: Complete the Stitching Lesson

5. Prototyping

After creating the user flows, we started working on the prototypes. We decided to make the physical prototypes of the HoloLens and iPad.

5.1 Hololens Interactions

Conceptual sketch for augmented/mixed reality prototype

5.1.1 Iteration 1

5.1.1.1 Process

The process of making a physical prototype started with sketching. The idea was to come up with a prototype for a wearable headgear that could emulate the Augmented reality UI that a user could interact with in real time. The conceptual sketch formed the primary basis for our prototyping process. The whole creative process was crucial in determining the direction the group took in making the first physical prototype(fig A). The idea was to translate the whole experience of wearing an Augmented reality/ Mixed reality headset to a physical low fidelity prototype that was wearable.

Fig A low fi physical prototype iteration 1

The first iteration of the prototype was made using packing cardboard and a pair of safety goggles. The cardboard was shaped like a hoop or headband that sits around the head and a holder in the form of a screen was hung in front of the headband and stapler pins were used to join the pieces together. Transparent plastic wrapping sheet salvaged from packaging was used

to create the impression of an augmented reality screen. It was made as a first attempt /working model prototype to test its usability in a real-world scenario with a user.

5.1.1.2 Evaluation

After testing it amongst group members, the prototype was found to be quite unsuitable for prolonged use and it required careful and precarious handling. It was too delicate to perform effectively as a prototype in a scenario that involved testing with users. This was largely attributed to the nature of the materials used. The cardboard and plastic wrapping film were salvaged from clothing packaging. However, the prototype provided a great learning experience for us in terms of the advantages and shortcomings of a physical prototype. The feedback from testing this led the way to the second iteration of the physical prototype.

5.1.2 Iteration 2

5.1.2.1 Process

The second iteration of the prototype was an improvisation of the first one in terms of the overall design, structure and the technique involved. It borrowed from the first iteration, the idea of using a cardboard hoop and a screen hung in front supported by cardboard frames. The improvisations came in the form of additional supports for the frame or screen holder and an adjustable headband, that would facilitate greater flexibility with users. It also used better quality of cardboard and sturdier mount board supports to hang the frame in front of the hoop. The Augmented Reality screen was emulated by using OHP sheets that had the interface sketched on. A simple buckle mechanism enabled the horizontal movement of the OHP sheet and mimicked the actions that would have taken place in Augmented Reality.

Fig B: the second iteration of the prototype.

5.1.2.2 Evaluation of the second iteration

A few simple changes in the overall design and structure of the prototype helped in improving the second iteration considerably over the first one. It was sturdier and hence facilitated longer use and did not require delicate or meticulous handling. However, it did have drawbacks and a significant one was that it was not easy to use. The hoop or headband and supports were not the most stable and had to be constantly adjusted and tinkered with while testing with a user. This hindered the overall flow of using the prototype and limited its usability. Another drawback was that the cardboard and mount board supports buckled under the weight of the frame after prolonged usage and the prototype had to be removed and readjusted. This was again largely attributed to the nature of the materials used to build the prototype.

5.1.3 Iteration 3

5.1.3.1 Process

The third iteration of the physical prototype drew from the shortcomings of the first and second design iterations. The physical design was considerably changed as well as the materials used to come up with the prototype. The prototype used a salvaged shoe box as the primary source material. It did away with the headband/hoop design and made use of a 90-degree part section of the cardboard shoebox. There is a cutout made to facilitate vision and a popup screen was hung in front of it with additional cardboard supports and an elastic band. The prototype has 2 elastic bands salvaged from face masks that act as supports when worn on the head. The entire design was fastened using stapler pins, the elastic bands act as tensioned supports and made the prototype sturdy. The popup screen in front has two loops behind to facilitate the use of OHP sheet screens. This in conjunction with the embroidery hoop works together as the prototype. An Arduino Uno along with a few LED lights kept under the embroidery hoop is used to emulate the appearance of dots in Augmented Reality that help guide the embroidery process.

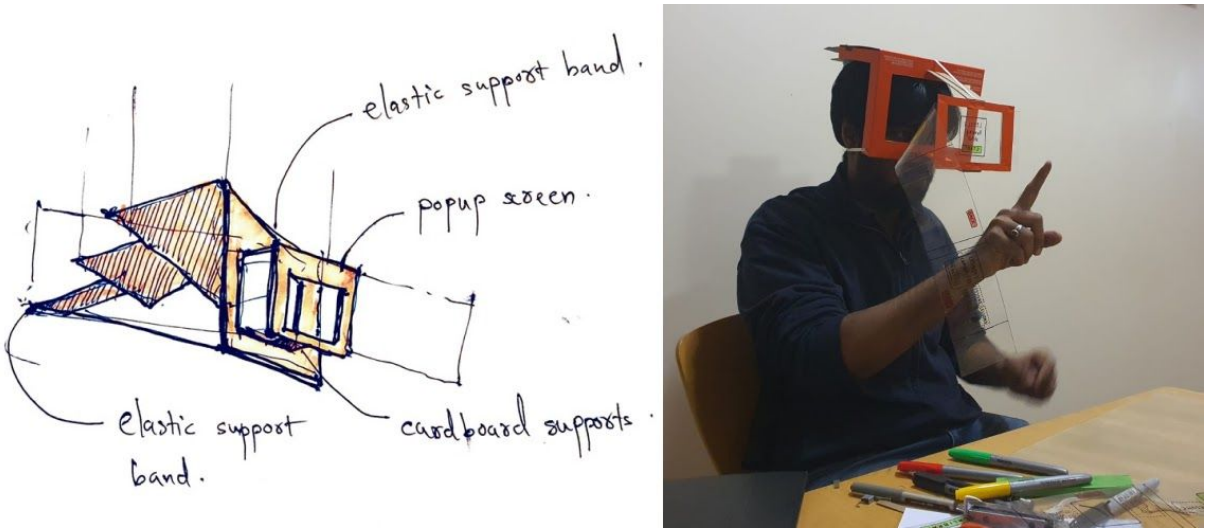


Fig C: schematic sketch of the third iteration of prototype and final product.

5.1.3.2 Evaluation of the third iteration

The third iteration was also tested on group members and it was found that the prototype was capable of prolonged use. This prototype was sturdier than the previous two prototypes and iterations and facilitated easier usage. This can be largely attributed to the changes in the design of the prototype and also the nature of the material used, the salvaged shoe box. However, there was a minor drawback in terms of the position of the popup screen in front. There was a comment regarding the length of the popup screen from the eye. After prolonged usage there were slight chances of getting an eye strain. Again this was largely dependent on the user's eyesight and existing medical conditions. Apart from this minor setback, the prototype was effective in conveying the interactions we intended and was an improvement over the first two design iterations.

5.1.4 Constraints

The group faced a few considerable constraints while working on the prototypes.It was predominantly attributed to the COVID-19 pandemic and the restrictive measures that were in place. This meant that the number of physical interactions the group had were restricted and kept minimal keeping in mind the safety of everyone involved.

Some of the key constraints that the group faced were:

- The raw materials were not easily available and were predominantly salvaged from various types of packaging and other recycled mediums.
- Testing of the prototypes were restricted to mainly group members as well as housemates who formed a part of the same cluster.
- User research was restricted due to time and logistical constraints.

5.2 Hoop and Fabric

The embroidery hoop or tambour frame and fabric are the brick and mortar of this project.It is quite literally the blank canvas on which a work of art would begin. The Augmented Reality prototype and the app are all tools that aim to aid in the actual physical process of embroidery. The embroidery hoop consists of 2 concentric wooden circles or frames that fit together when placed on top of each other.The outer hoop is larger and has a mechanism that lets the user adjust the level of tightness. The inner concentric circle in conjunction with the outer circle helps to hold and secure the fabric in place.They come in various sizes and can be between 4 and 5 inches to upto 12 and 18 inches. They also come as rectangular frames but circular frames are the most widely used, owing to the ease of use and workability. For use with our physical prototype we have used a circular hoop(size) along with a repurposed handkerchief/cloth to act as the fabric medium.

5.3 Screen based Interactions

After carefully studying the use cases, we came up with the conclusion that an Apple iPad OS app would be the ideal choice. It is one of the most favourite gadgets for digital artists all around the world. There are over 500million users. Apple Pencil, an iPad accessory is one of the best wireless drawing stylus available in the market right now. We can make use of it's capabilities to help our users to design their embroidery. With our constraints in time to come with the prototype, we could only manage to create the prototype initially only for one platform, so we decided to go with iPad OS.

For prototyping the screen-based interaction, we made an iPad prototype with recycled cardboard. We made the iPad prototype in such a way that we can insert A4 sheets inside it. We drew the screens on A4 paper and stacked it one by one inside the prototype. For testing user-flows with the end-user, we will have to stack screens in order. Each page will represent a box in the user flow. When they interact with it, we can remove the paper on top and then the next box in user-flow will be visible to the user.

After creating a basic sketch of the screens on paper, we decided to make the digital prototype in Figma due to their team collaboration features. Figma is a cloud-based vector graphics editor and primarily web-based prototyping tool, with additional offline features enabled by desktop applications for macOS and Windows. [CITE] Figma works on any operating system that runs a web browser. Since all of the team members are using different operating systems, Figma was our best bet. We created designs for iPad OS. For the screen-based interactions on iPad, we followed the Apple Human Interface Guidelines.

5.4 Designing for Safety

When a user gets too immersed in the Hololens experience, they might ignore the physical environment around them. As a result, they can bump into objects or people. To prevent such behaviour, we added warnings and reminders for users to check their surroundings. Warning messages will pop-up when the system detects unusual behaviours from the user.

5.5 Medium fidelity prototype

5.5.1 Designing visuals for Hololens

For designing the visuals for the iPad App and the Hololens, we decided to take a minimal approach. We referred to Microsoft Hololens 2 documentation[3] before starting to design visuals for the user interface. Each decision we take to design will not only affect the aesthetics, but it will influence the functional aspect as well. We tried to reduce the clutter in the UI as much as possible. It will also create an immersive experience in AR. On taping each button, we will also provide audio feedback.

The foundational elements for designing a great mixed reality experience according to Microsoft guidelines are:

5.5.1.1 Color, light, materials

Inside a user's room, there can be diverse lighting conditions. We will have to create content with appropriate levels of contrast to help with clarity. For instance, white will look bright, while black will appear transparent. Microsoft guidelines suggest to use (R 235 G 235 B 235) as the white value and reduce the use of pure white (R 255 G 255 B 255). In order to draw attention to objects or points of interaction we will have to use contrasting colors, brightness, and lighting. Materials are important for providing visual feedback for the various types of user input interactions.

5.5.1.2 Scale

The scale of an object is an important visual cue, giving a viewer a sense of the size of an object as well as cues to its location. For us, we have to show the needle-in and needle-out position. Distance between the user and the hoop/fabric is also to be considered.

5.5.1.3 Typography

Text is an important element for delivering content app experience. Readability and clarity are the two key factors for designing the typography. Since it is an augmented reality experience, the font can be both two dimensional or three dimensional. But Microsoft guidelines for Hololens suggests that we use a two-dimensional style for the type because it is more legible and easier to read. Just like other elements text content can be placed in the actual environment where it can be world locked and observed from any angle. The parallax effect between the type and the environment also adds depth to the experience.

For the screen-based interactions on iPad, we followed the Apple Human Interface Guidelines. We created a colour palette that we can use throughout the app. Using a colour palette will ensure uniformity and consistency throughout the app. We choose "brick red" as the accent colour. Using high contrast colours offers better readability in augmented reality experiences.

5.5.1.4 Sound

Microsoft Hololens documentation suggests using sound to inform and reinforce the user's mental model of application state. When we use sound to connect the auditory and the visual in this way, you deepen the intuitive nature of interactions and increase user confidence. For prototyping sound interactions, we use an Arduino connected to a piezo.

5.5.2 Designing for Apple iPad

For designing for iPad, we followed Apple’s Human Interface Guidelines [4]. The key principles for designing for iPad are:

5.5.2.1 Clarity

Legible texts and precise icons provide clarity to the user interface. Negative space, color, fonts, graphics, and interface elements subtly highlight important content and convey interactivity.

5.5.2.2 Deference

When designing content for iPad, it should always fill the entire screen, while translucency and blurring often hint at more. Apple guidelines suggest to use bezels, gradients, and drop shadows to keep the interface light and airy, while ensuring that content is paramount.

5.5.2.3 Depth

Depth is used to convey hierarchy and facilitate understanding. Providing a sense of depth will also improve the discoverability and it enables access to functionality and additional content without losing context.

6. Reference:

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5. Comparing success and engagement in gamified learning experiences via Kahoot and Quizizz - https://www.researchgate.net/publication/331467462_Comparing_success_and_engagement_in_gamified_learning_experiences_via_Kahoot_and_Quizizz
6. Association of Enjoyable Leisure Activities With Psychological and Physical Well-Being https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2863117/

7. Annex 1

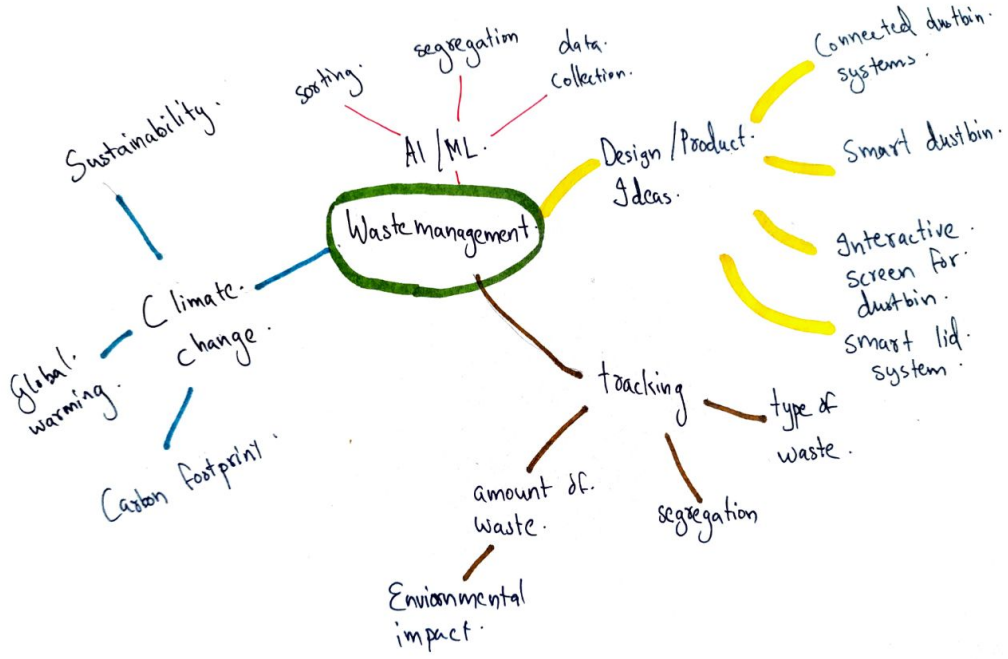


Fig 1.1 mind mapping of waste management idea

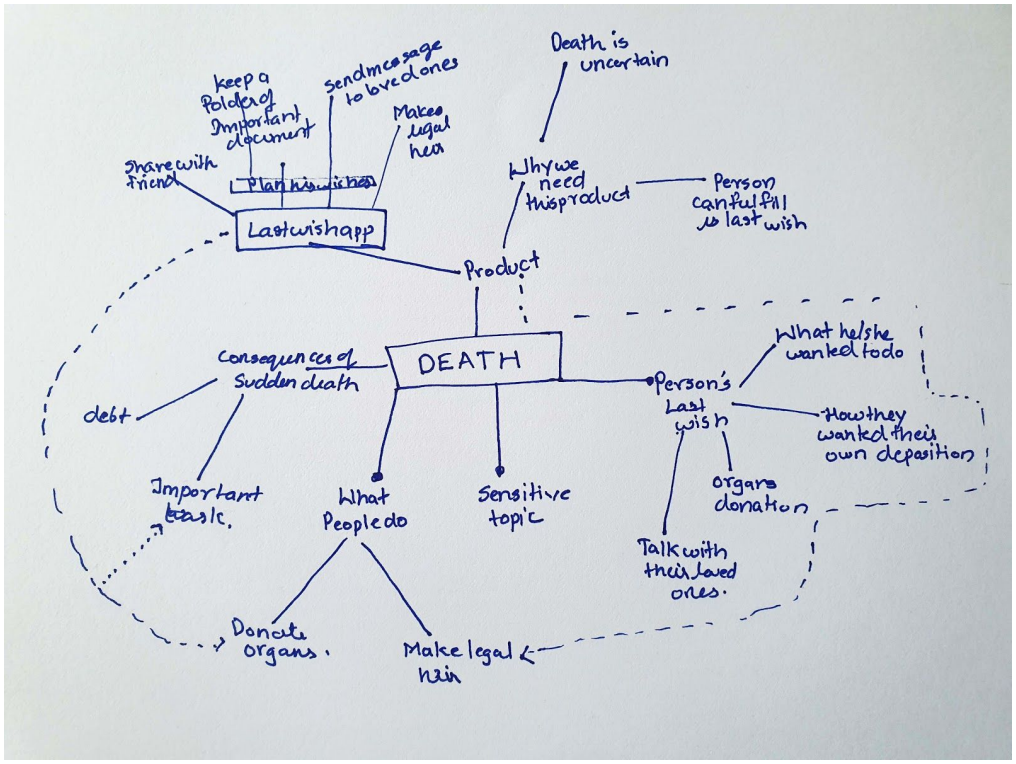


Fig 1.2 mind mapping of Last Wish idea

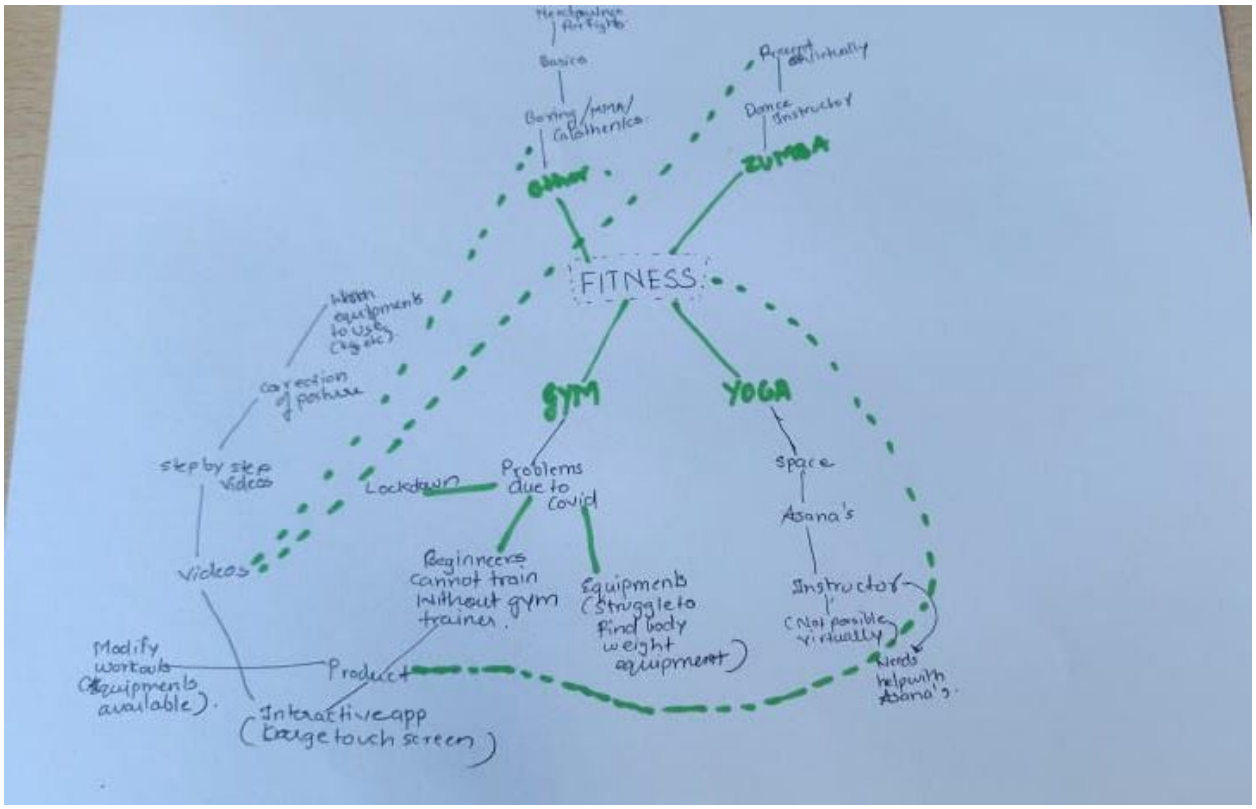


Fig 1.3 Mind mapping of Fitness app idea

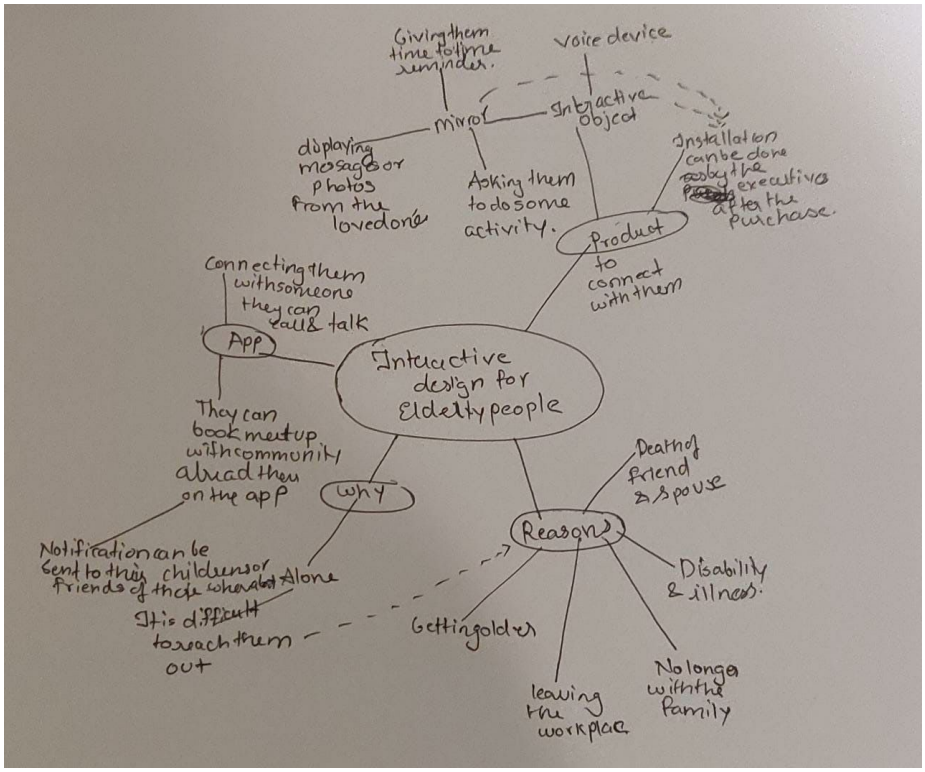


Fig 1.5 mind mapping of Loneliness among elderly idea

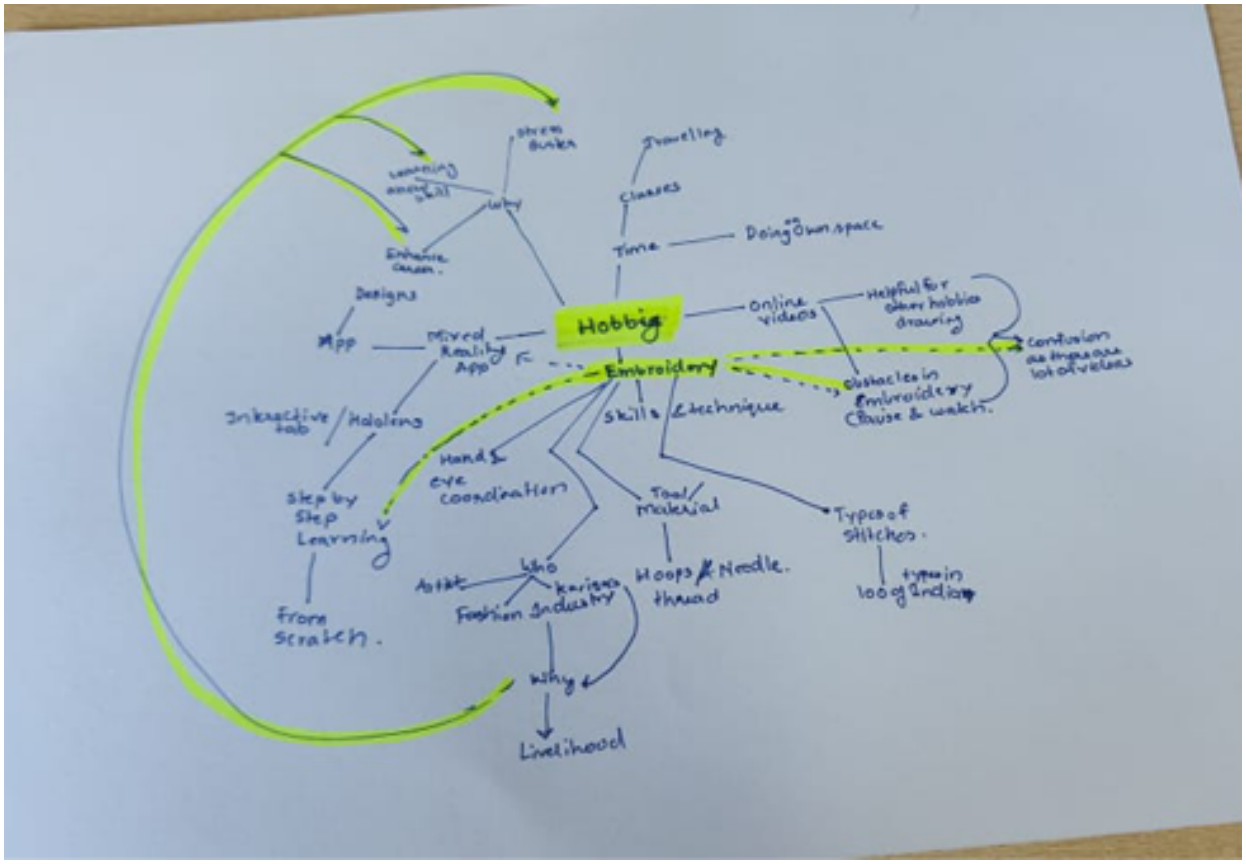


Fig 1.4 mind mapping of Hobby and soft skills idea.

8. Annex 2

Figure 2.1 Schematic sketch of Augmented reality prototype

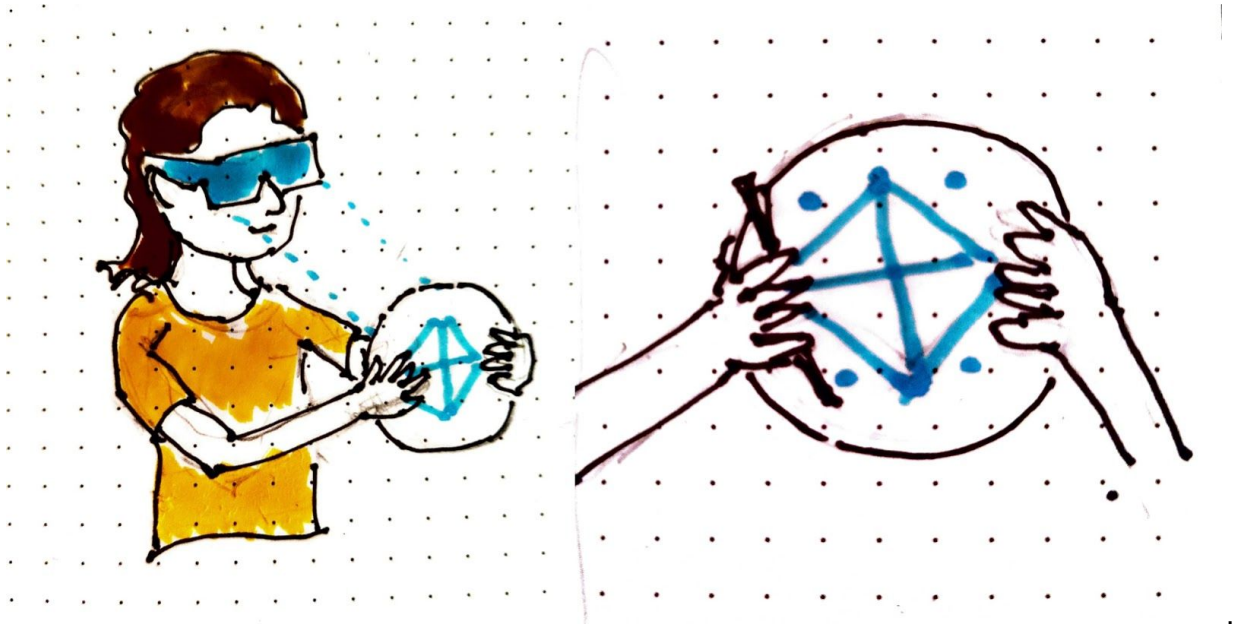
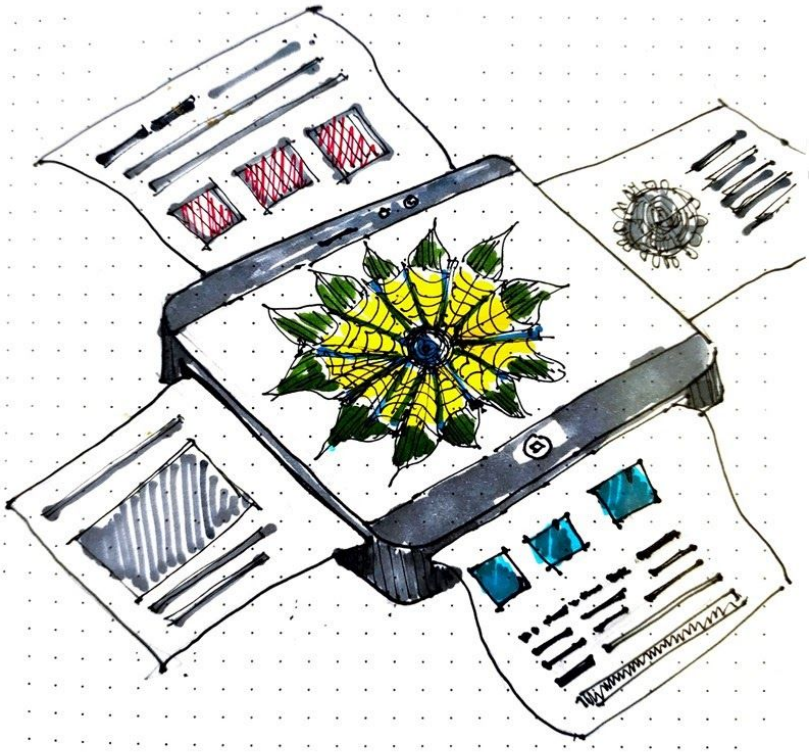
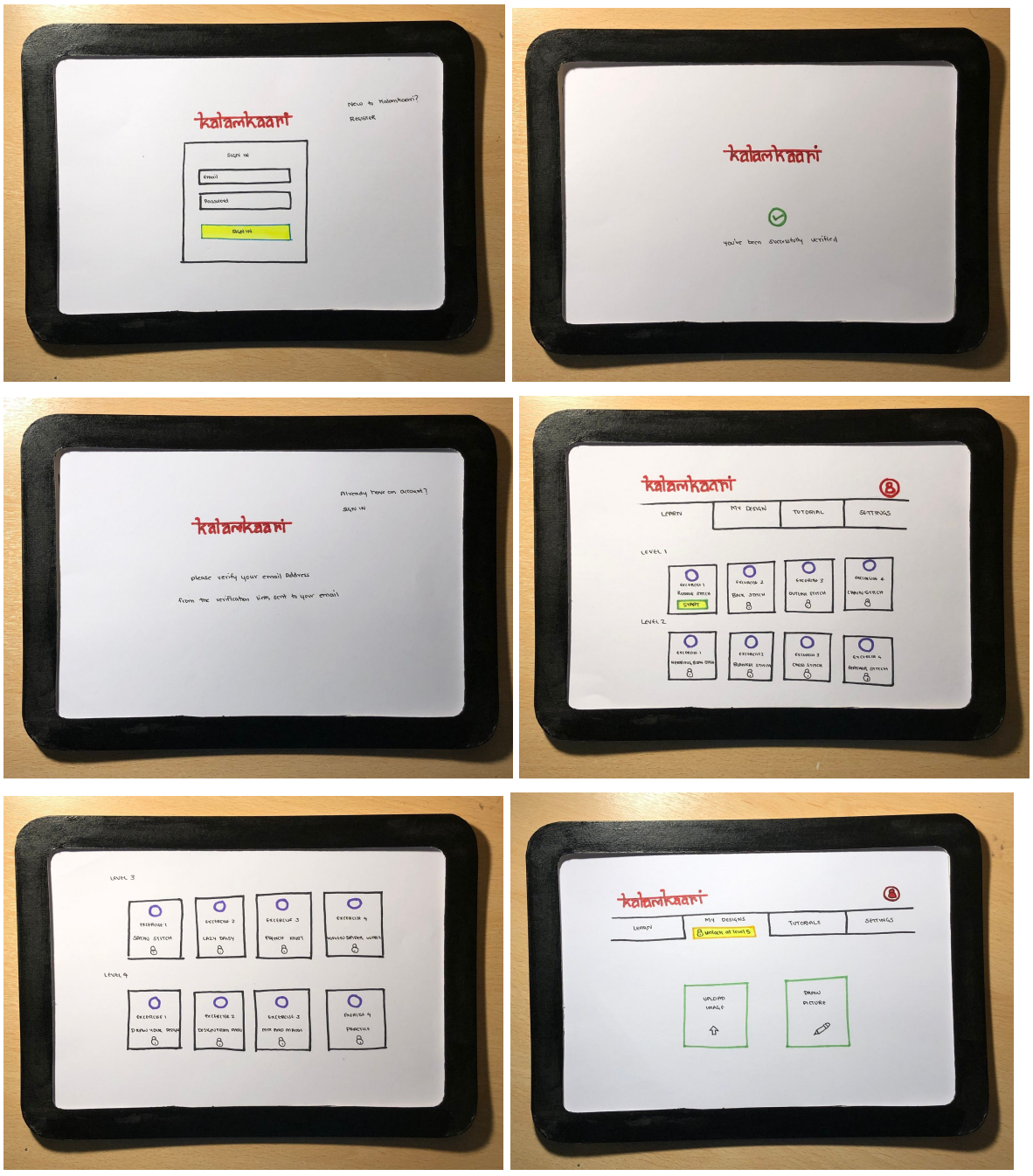


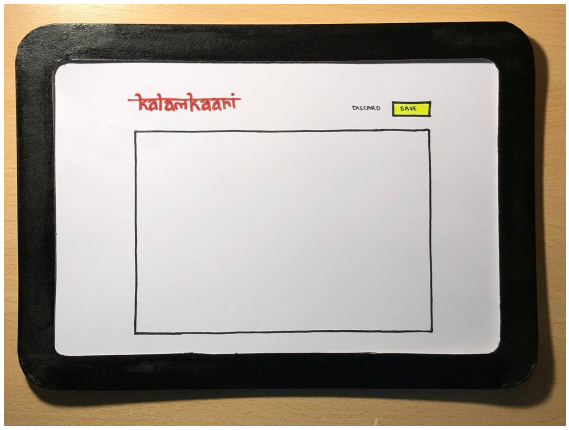
Figure 2.2 Schematic sketch of app prototype



9. Annex 3

Figure 3.1 Ipad Prototypes

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DISCARD
SAVE


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Discard
SAVE


kalamkaari
GO HOME
PLEASE OPEN THE KALAMKAARI APP ON HOLOLENS

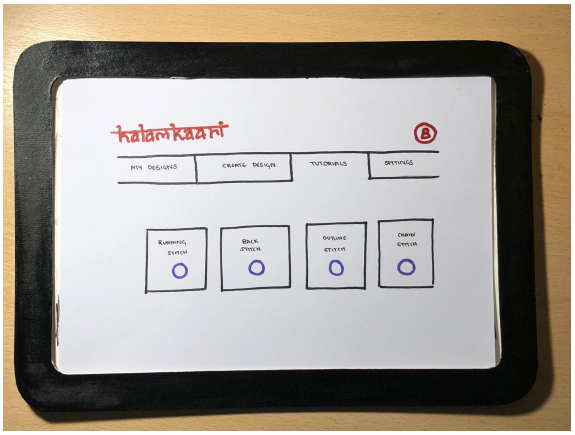
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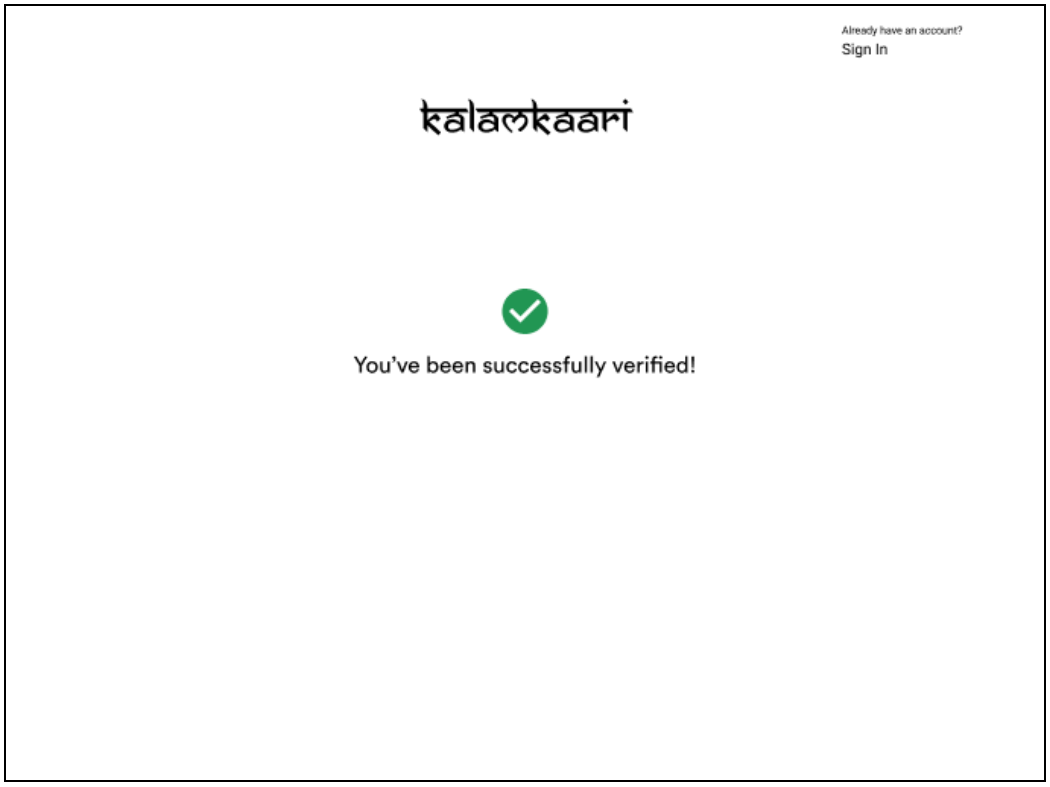
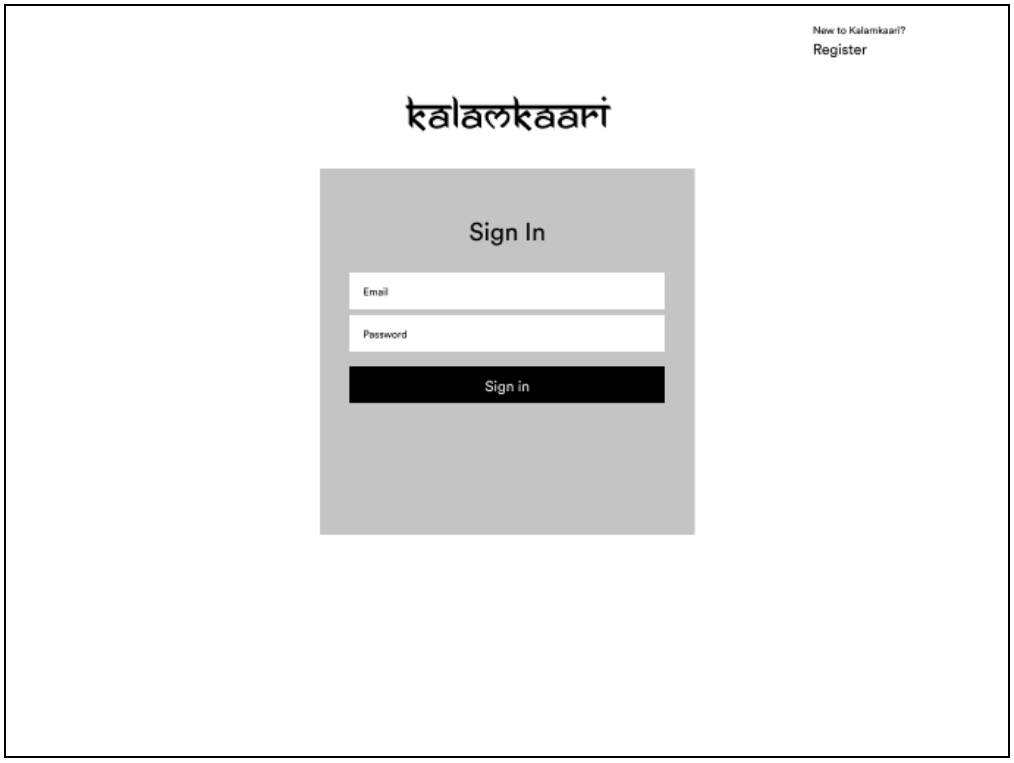
Figure 3.2 Wireframes version 1.0

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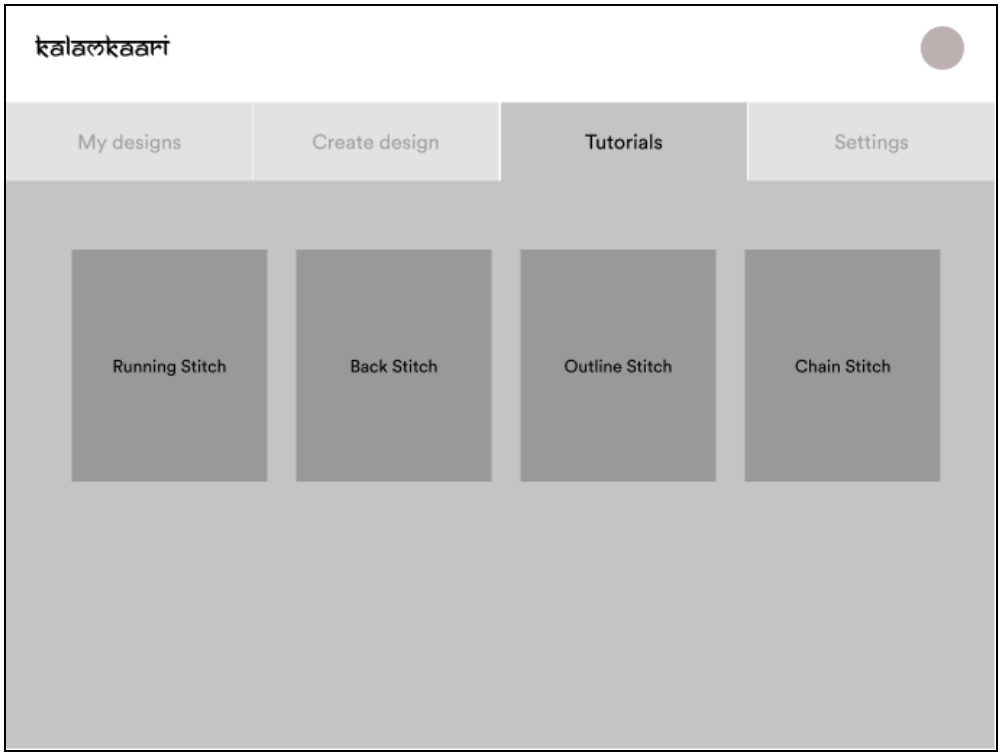
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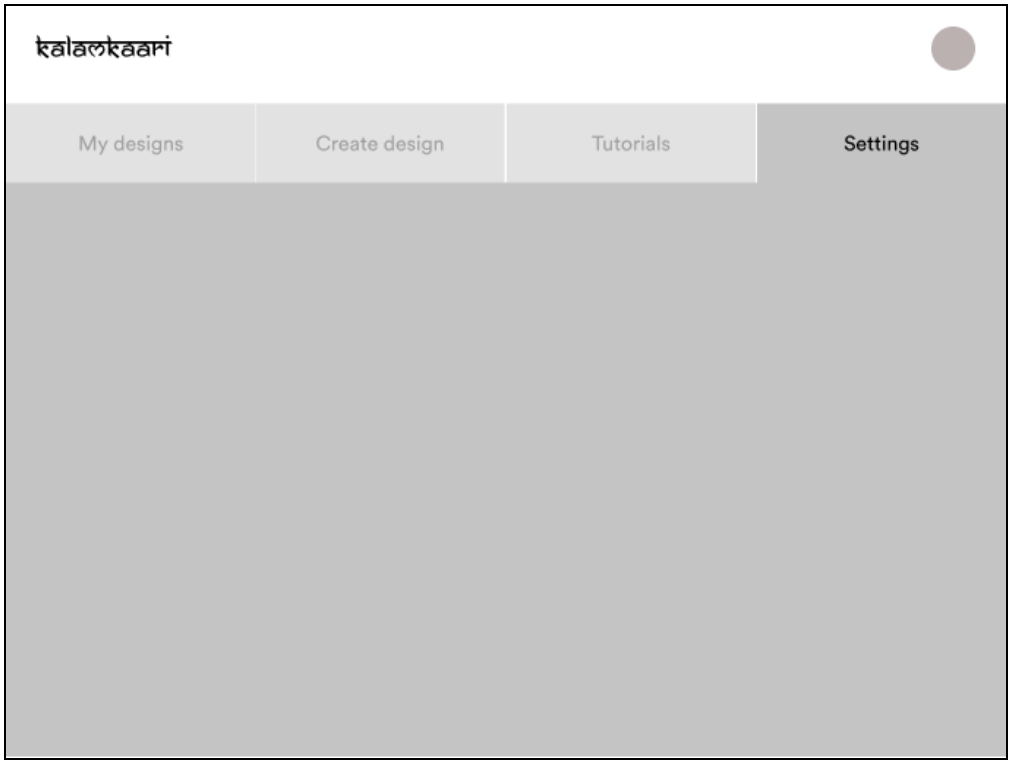
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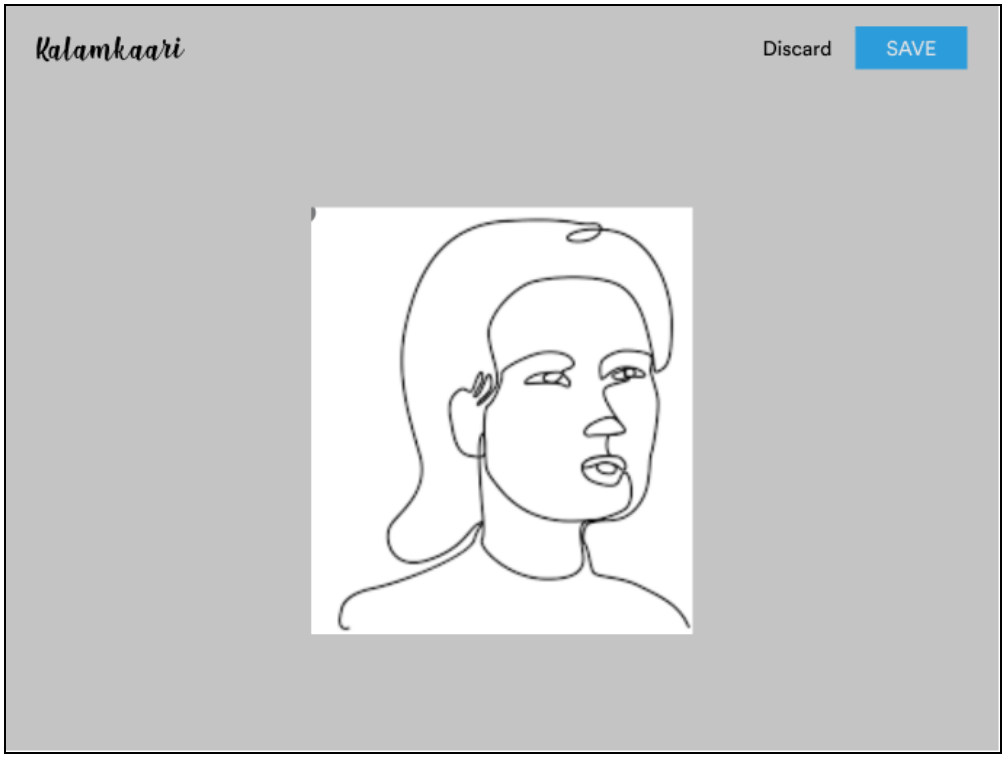
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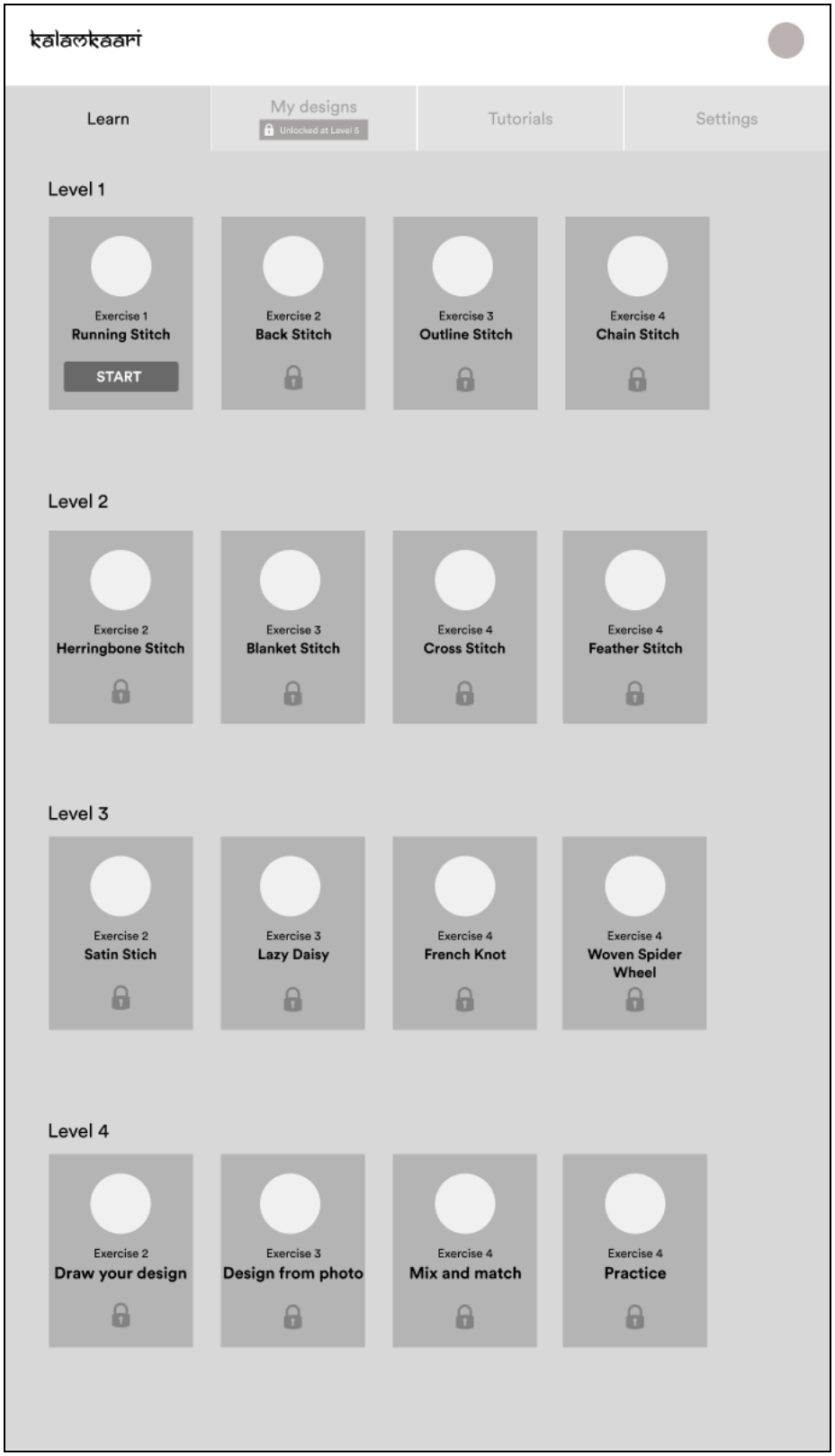
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Lazy Daisy
Exercise 4
French Knot
Exercise 4
Woven Spider Wheel
Level 4
Exercise 2
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Exercise 3
Design from photo
Exercise 4
Mix and match
Exercise 4
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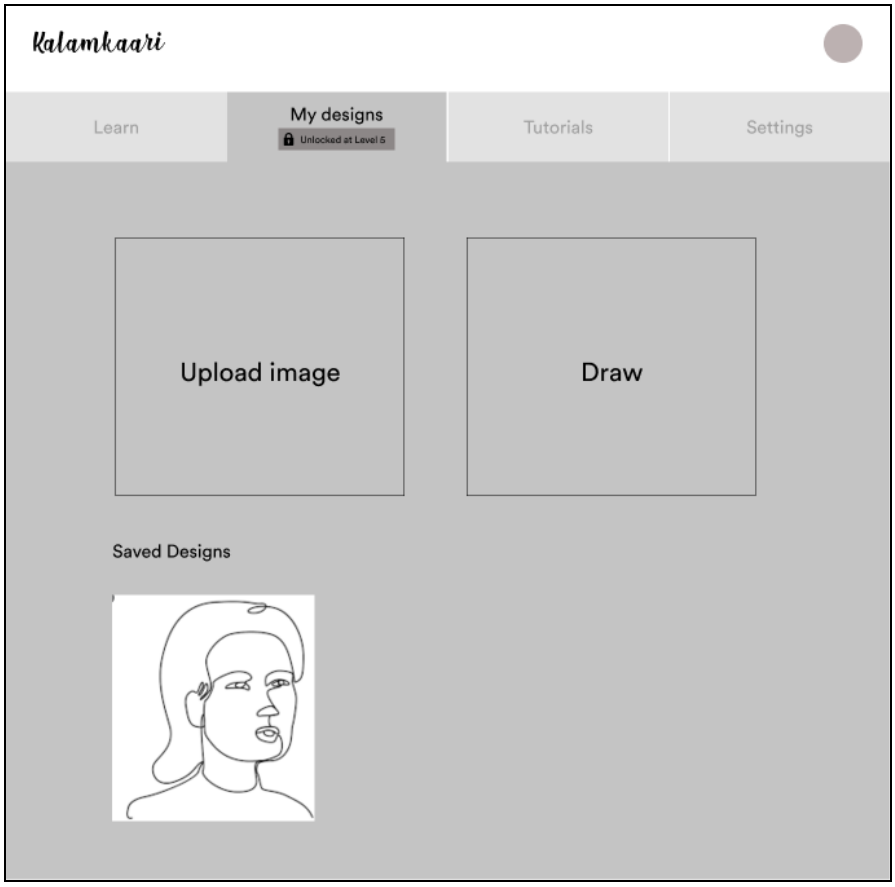
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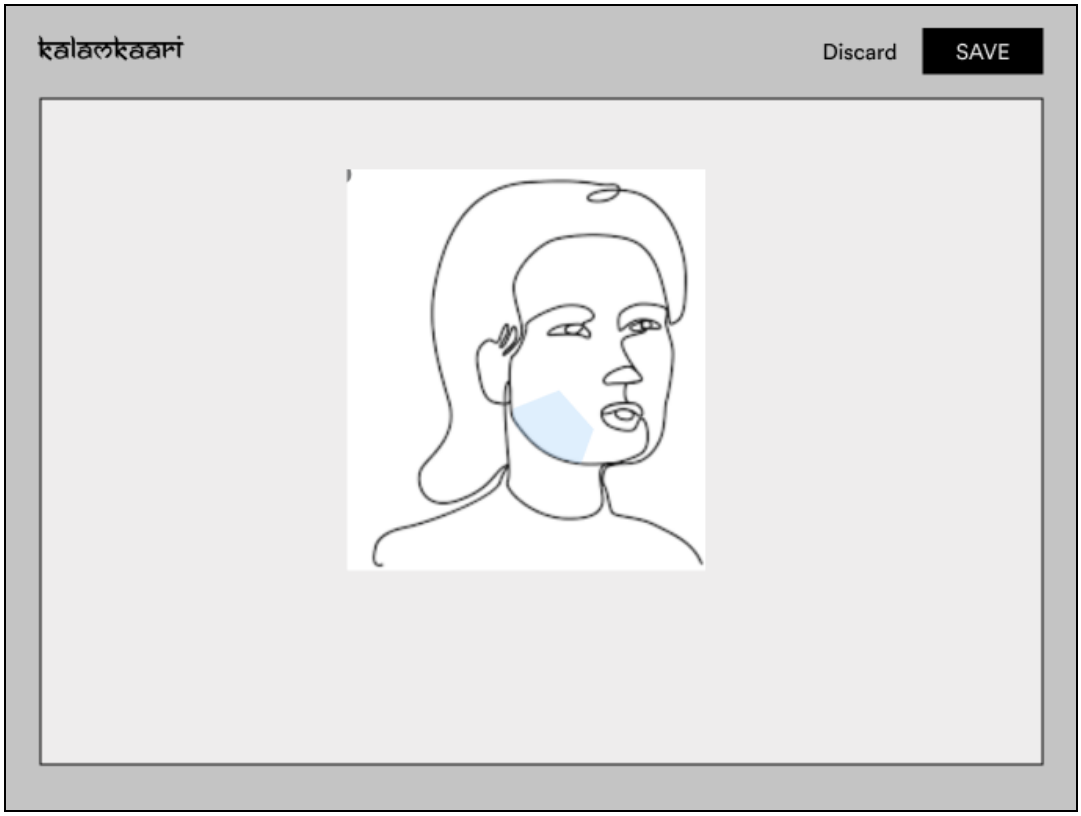
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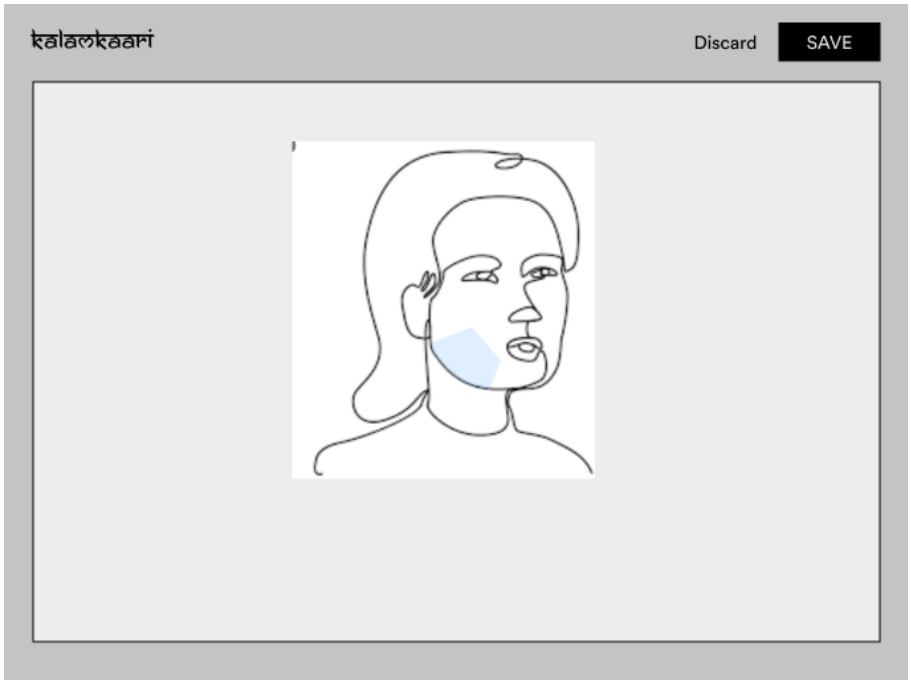
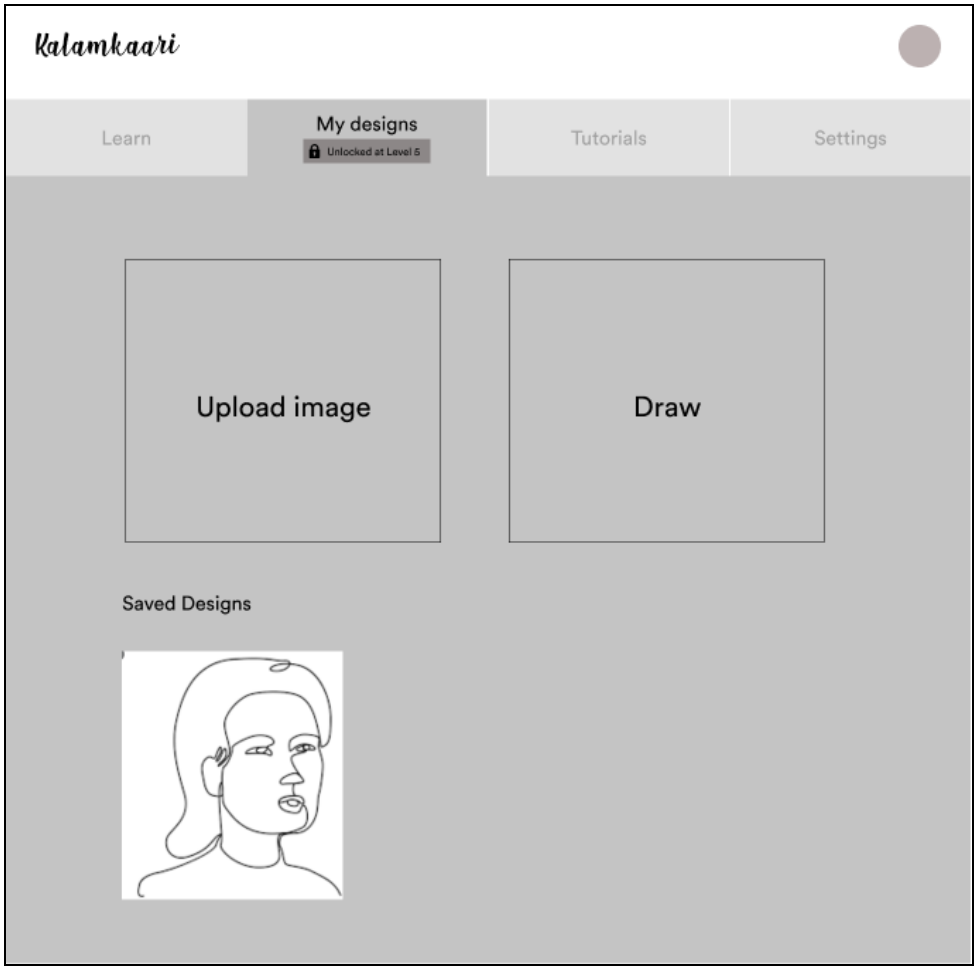
Please open the Kalamkaari app on Hololens

Fig 3.3 Low fidelity app prototype version 2.0

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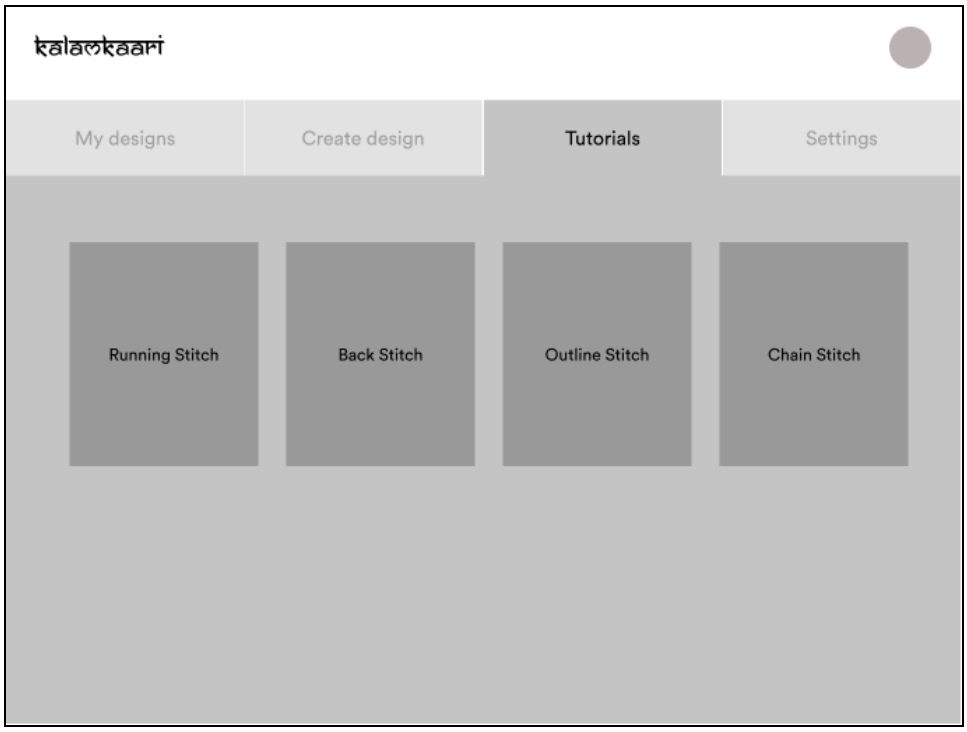
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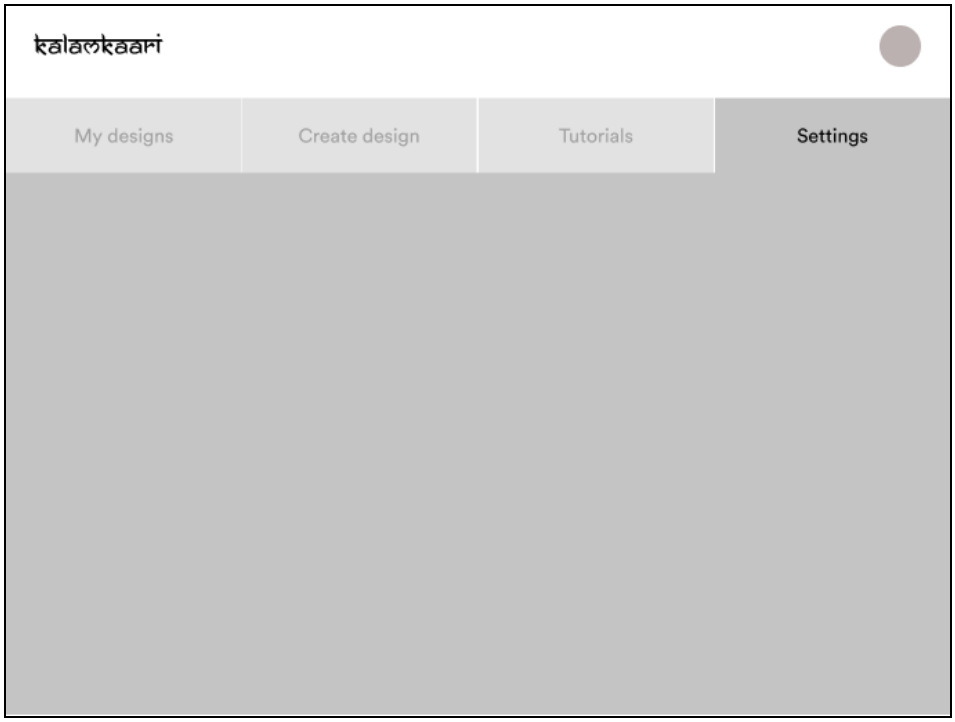
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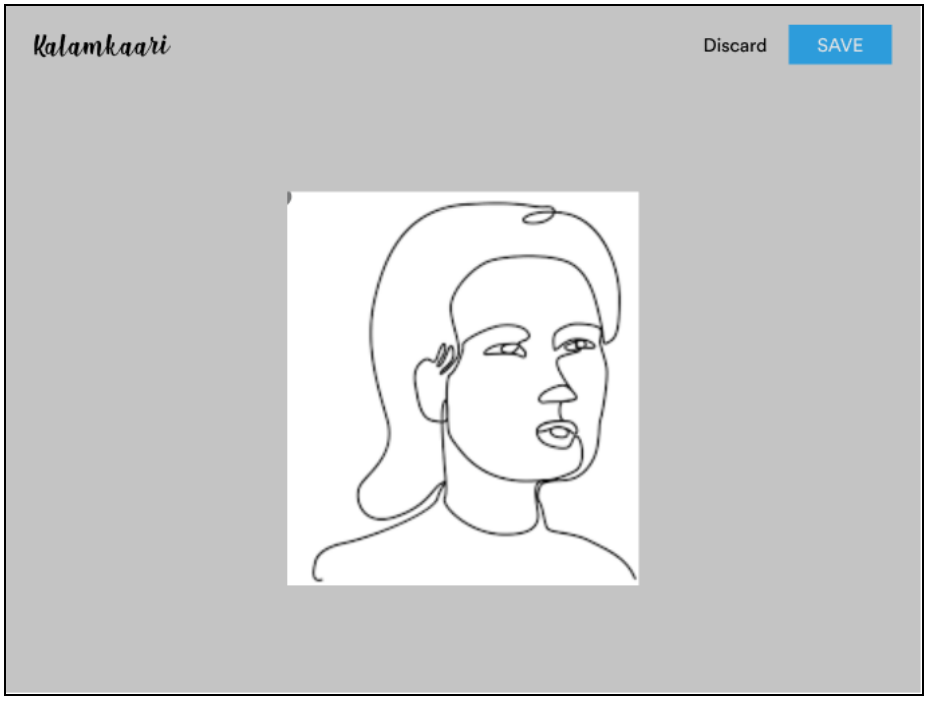
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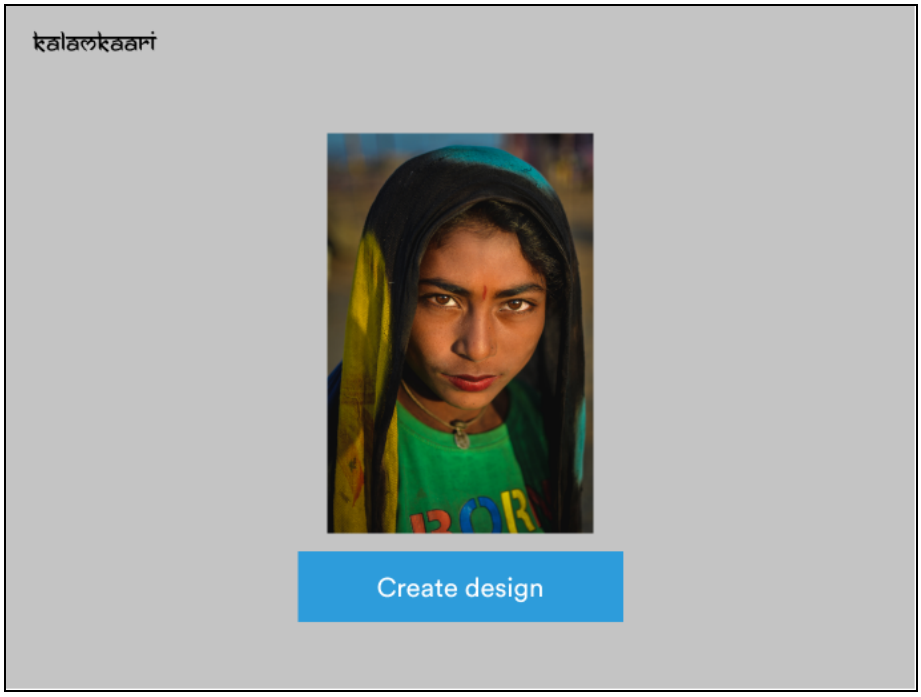
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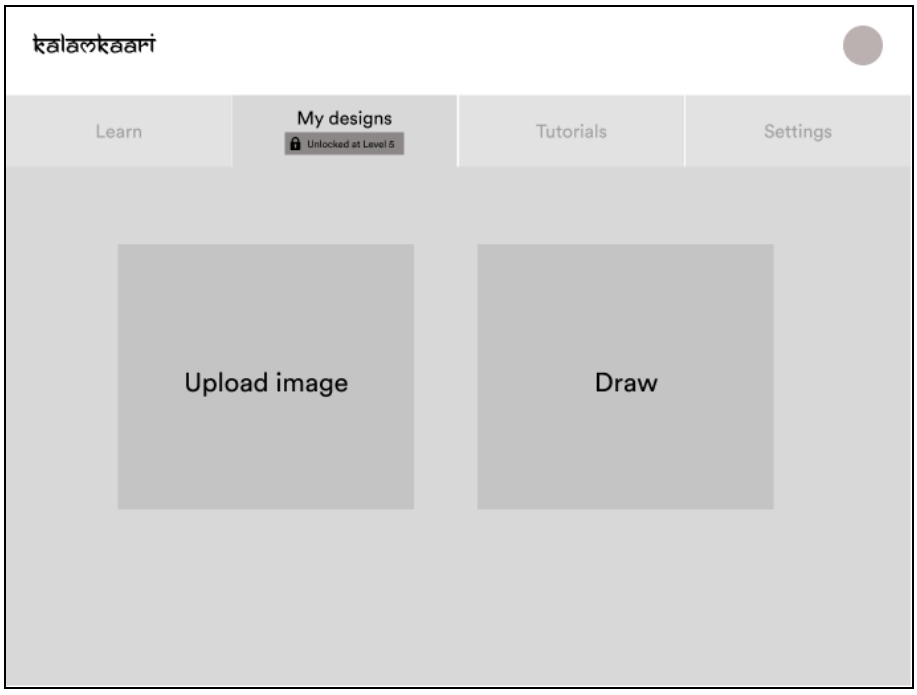
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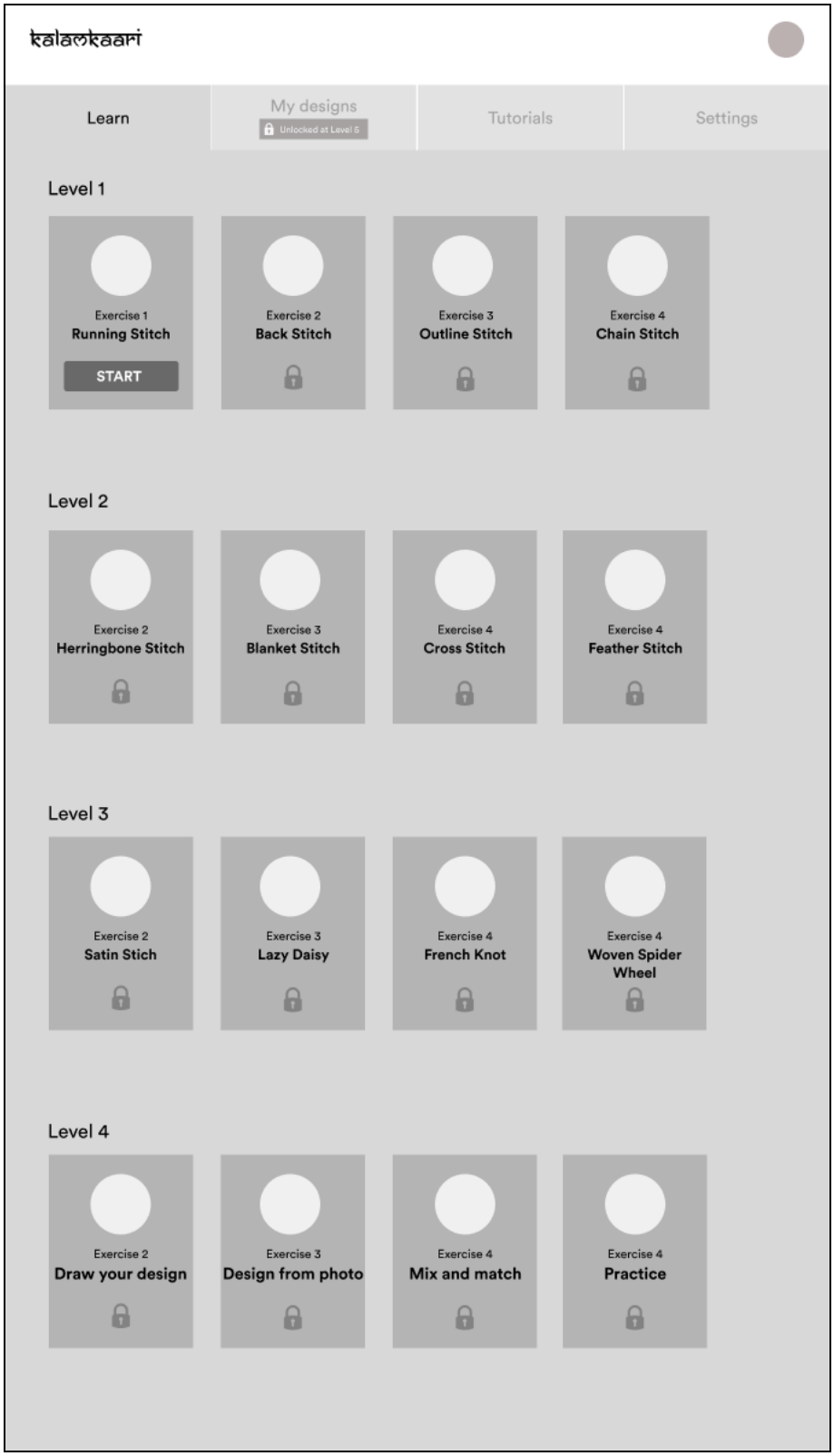
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Exercise 3
Lazy Daisy
Exercise 4
French Knot
Exercise 4
Woven Spider Wheel
Level 4
Exercise 2
Draw your design
Exercise 3
Design from photo
Exercise 4
Mix and match
Exercise 4
Practice

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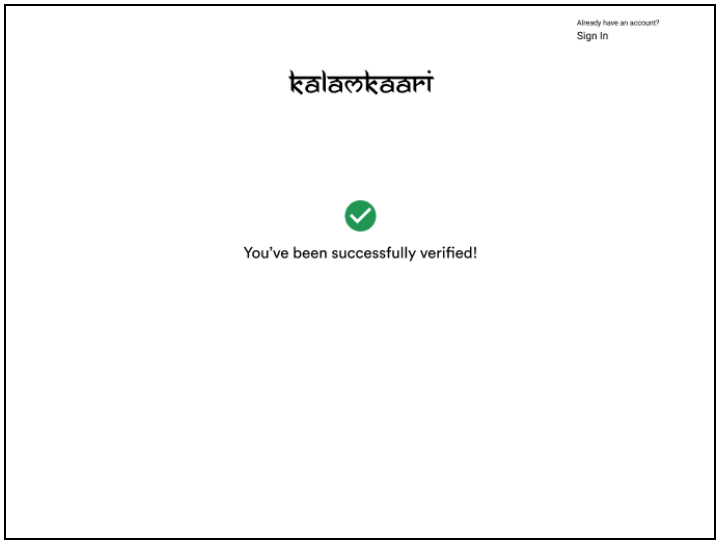
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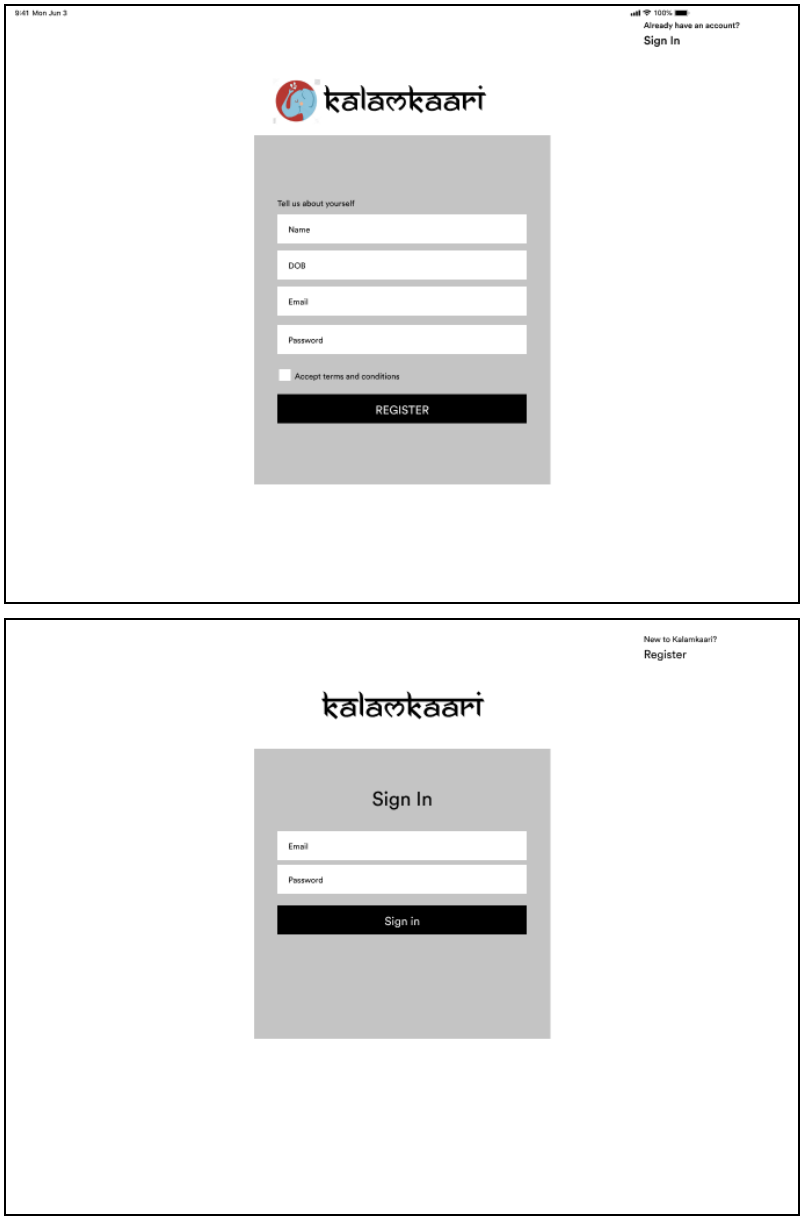
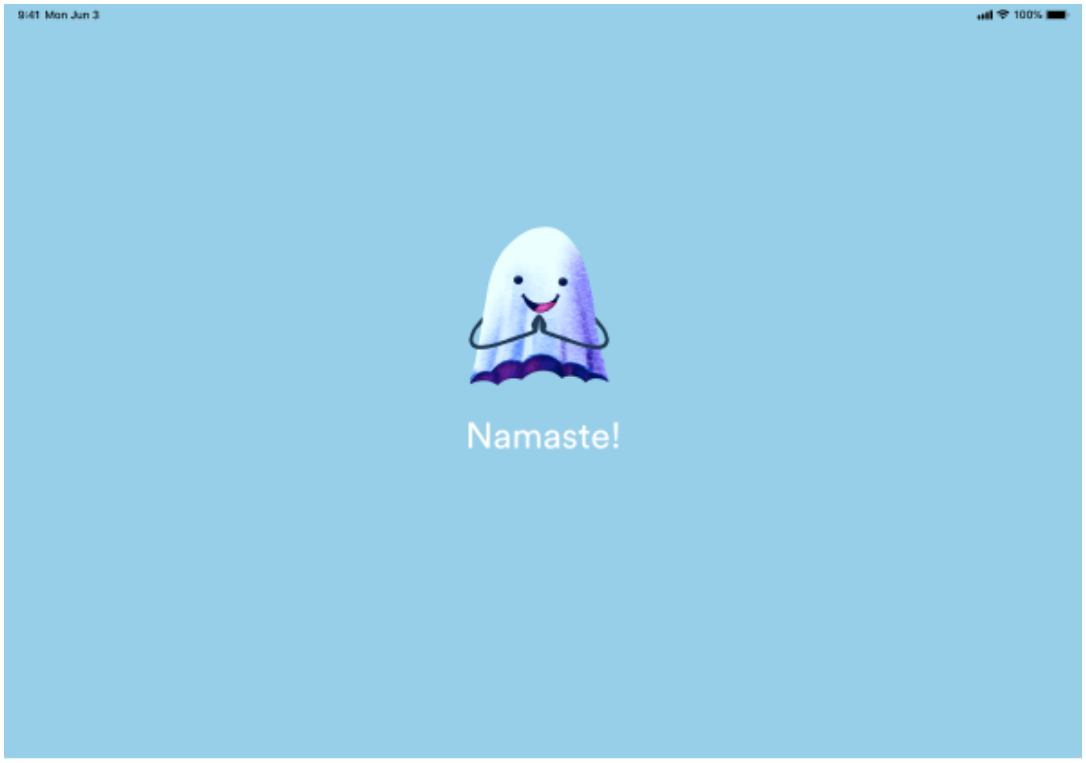


Figure 3.4 Mid fidelity app prototype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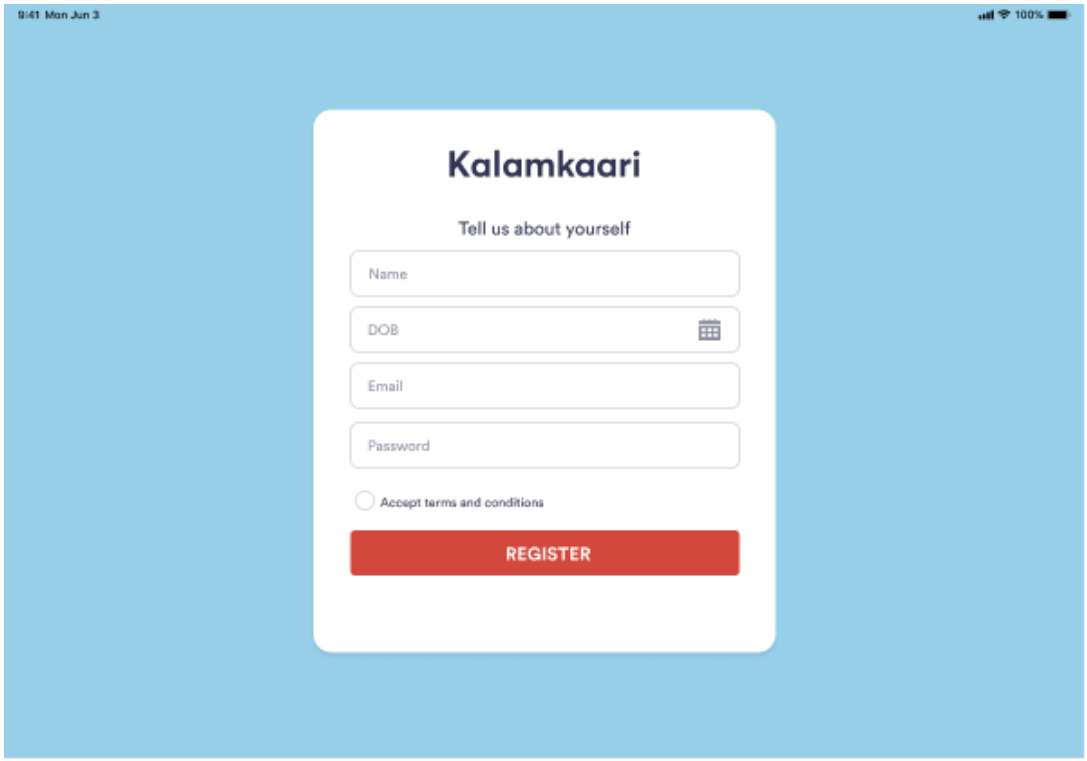
Namaste!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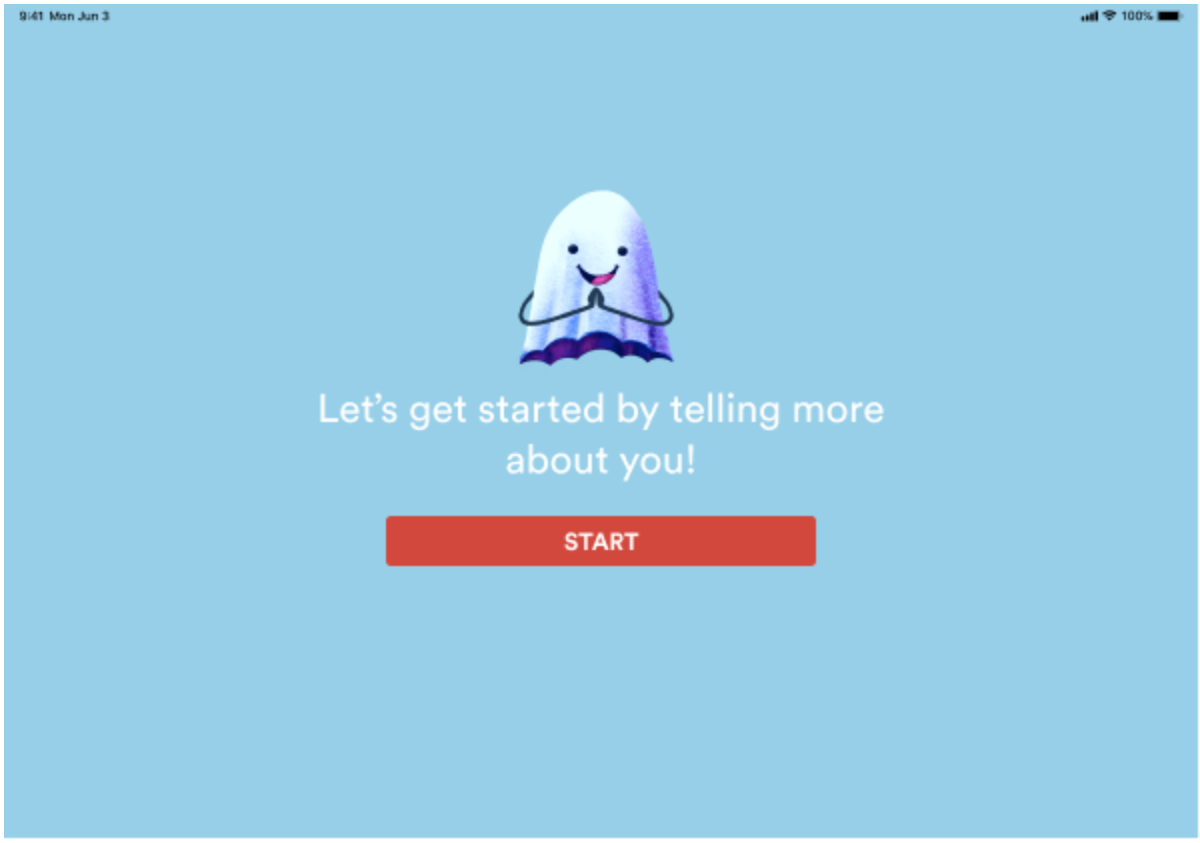
DOB
Email
Password
Accept terms and conditions
REGISTER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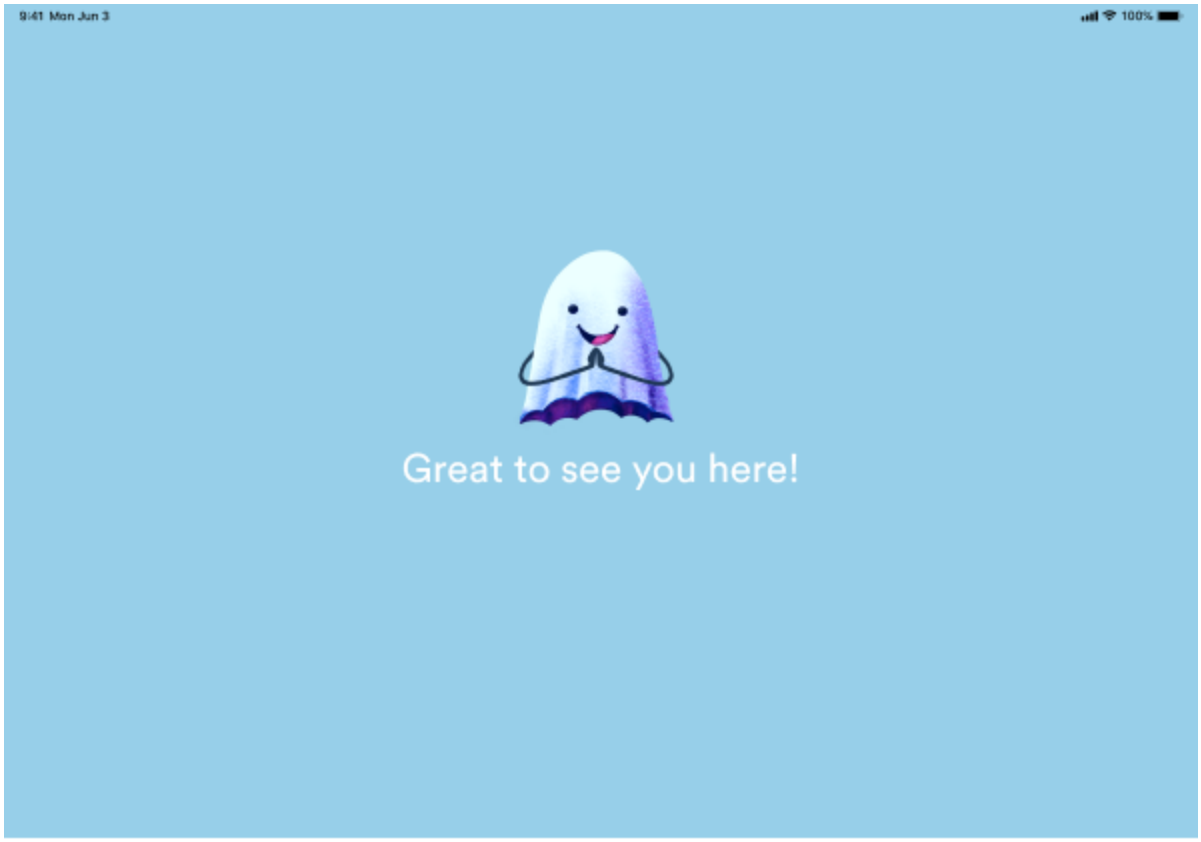
Let's get started by telling more about you!
START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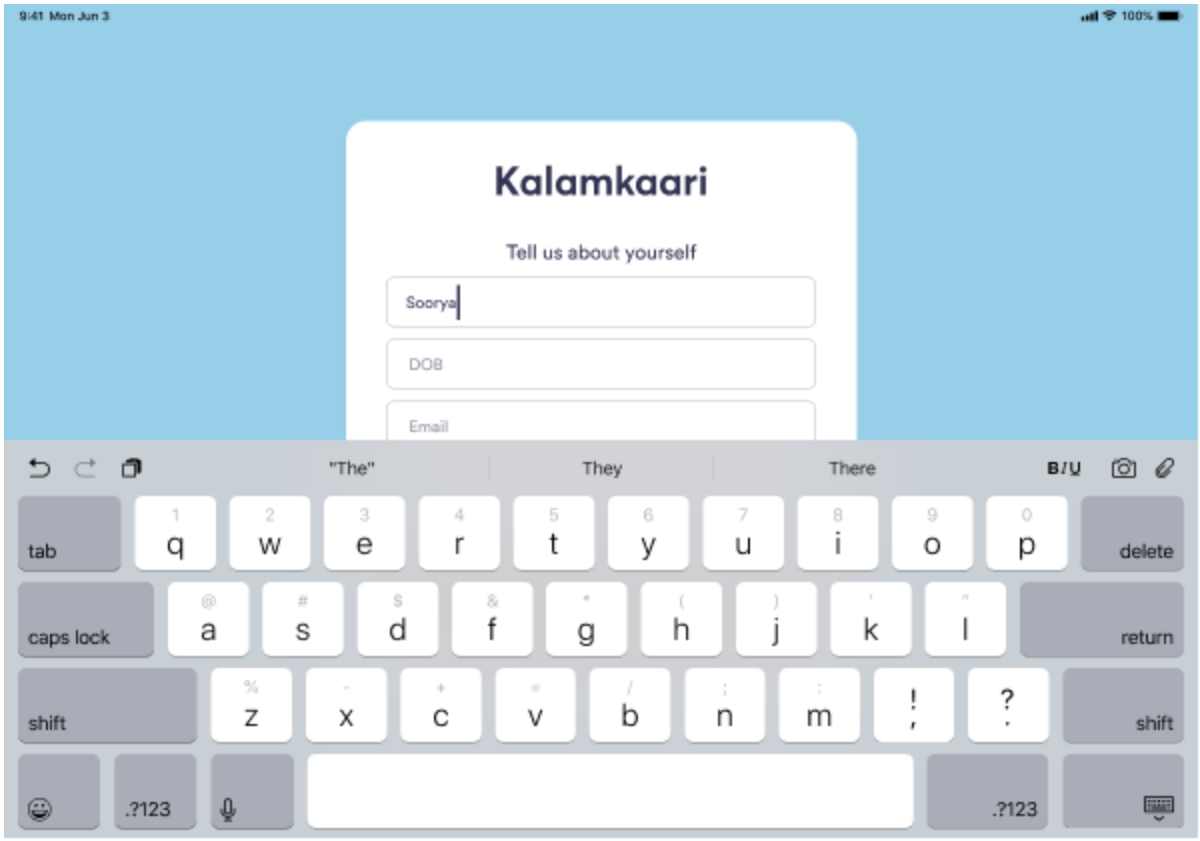
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Kalamkaari
Tell us about yourself
Soorya
DOB
Email
"The"
They
There
tab
delete
caps lock
return
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shift
.?123
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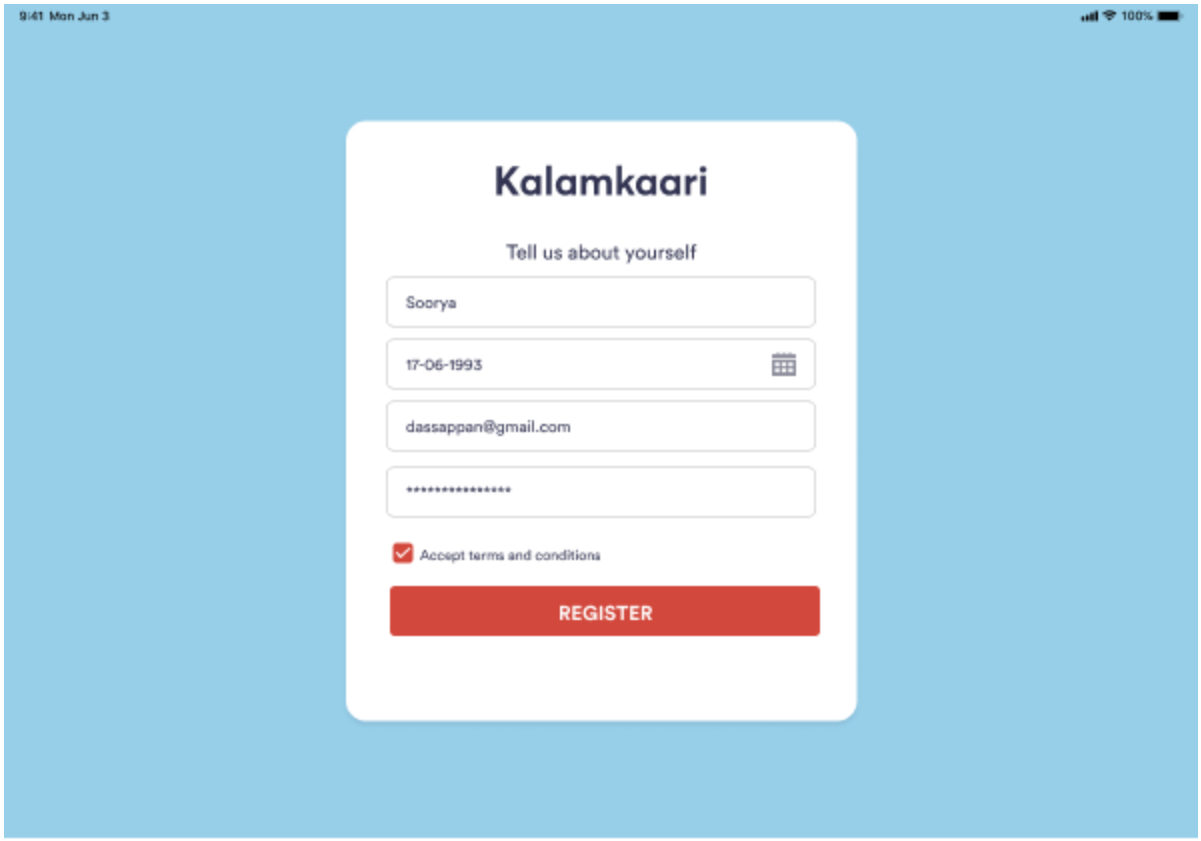
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Kalamkaari
Tell us about yourself
Soorya
17-06-1993
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Accept terms and conditions
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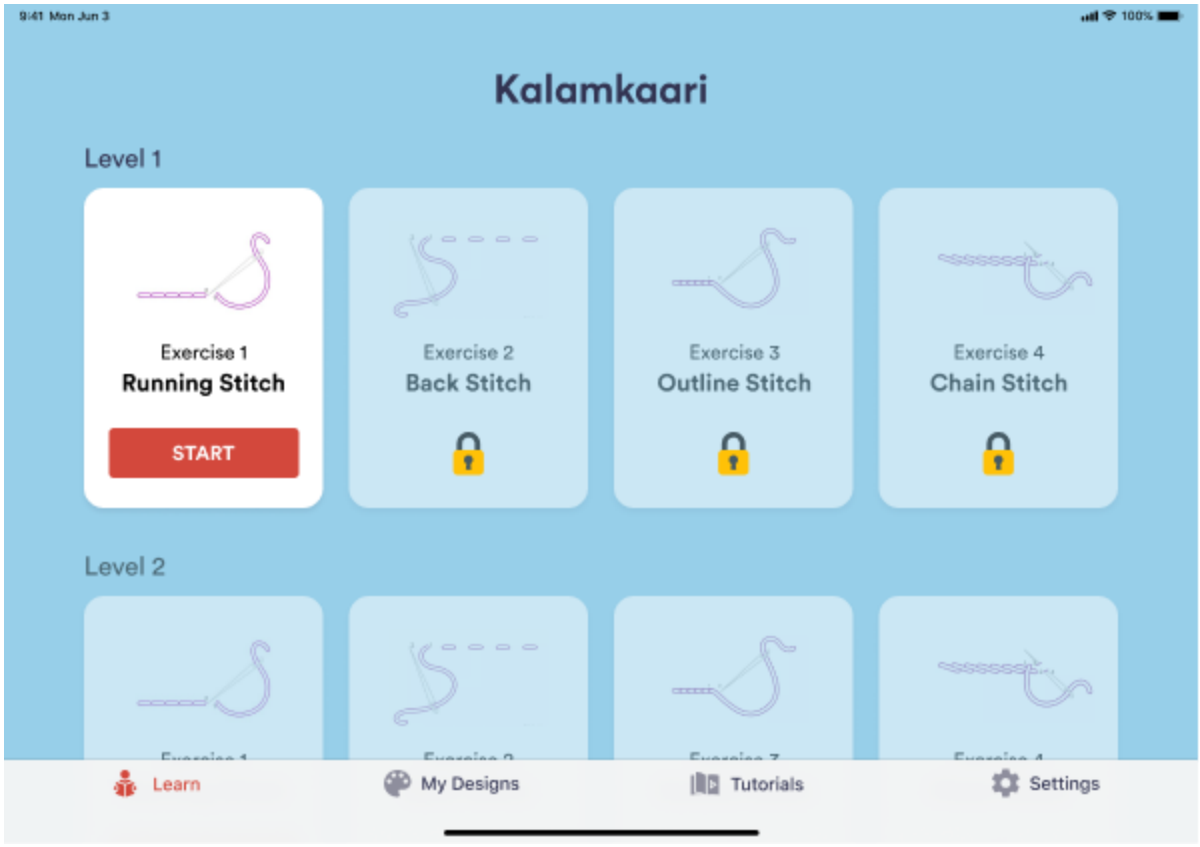
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Level 1
Exercise 1
Running Stitch
START
Exercise 2
Back Stitch
Exercise 3
Outline Stitch
Exercise 4
Chain Stitch
Level 2
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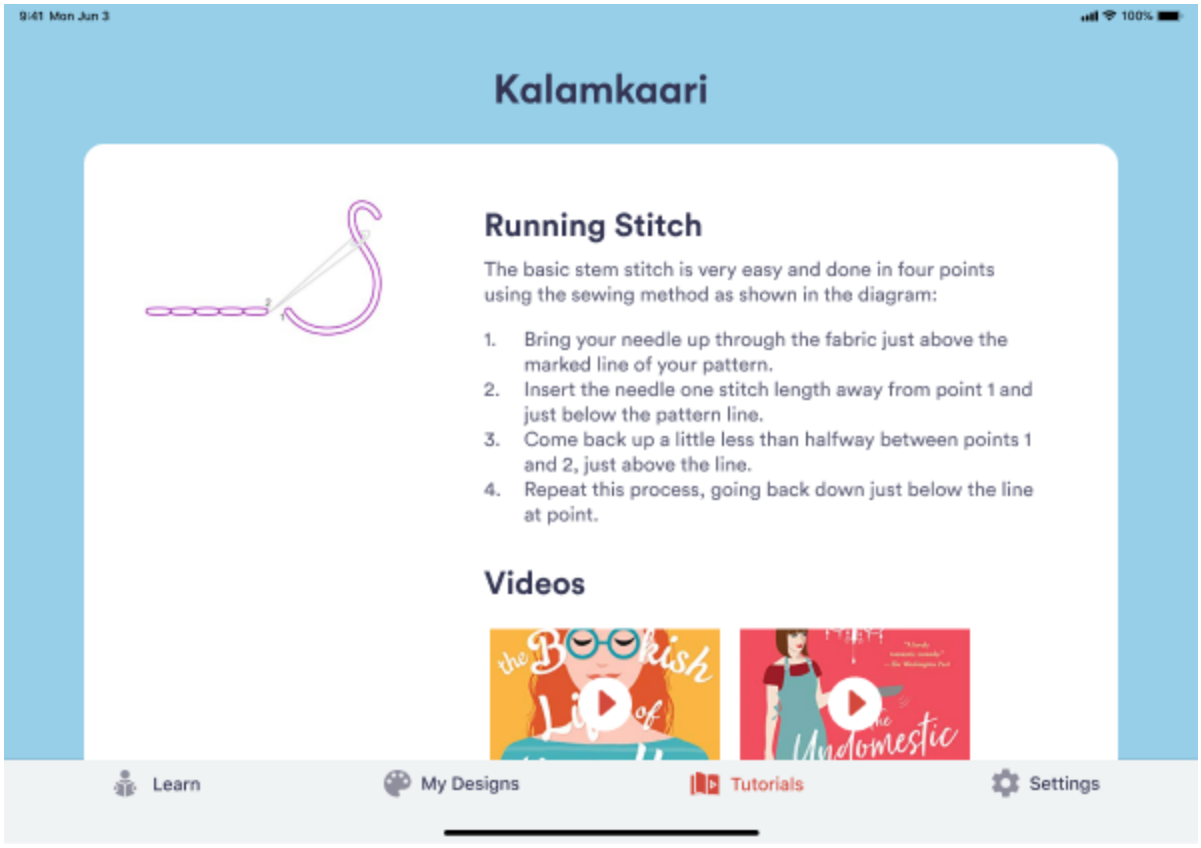
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Running Stitch
The basic stem stitch is very easy and done in four points using the sewing method as shown in the diagram:
1. Bring your needle up through the fabric just above the marked line of your pattern.
2. Insert the needle one stitch length away from point 1 and just below the pattern line.
3. Come back up a little less than halfway between points 1 and 2, just above the line.
4. Repeat this process, going back down just below the line at point.
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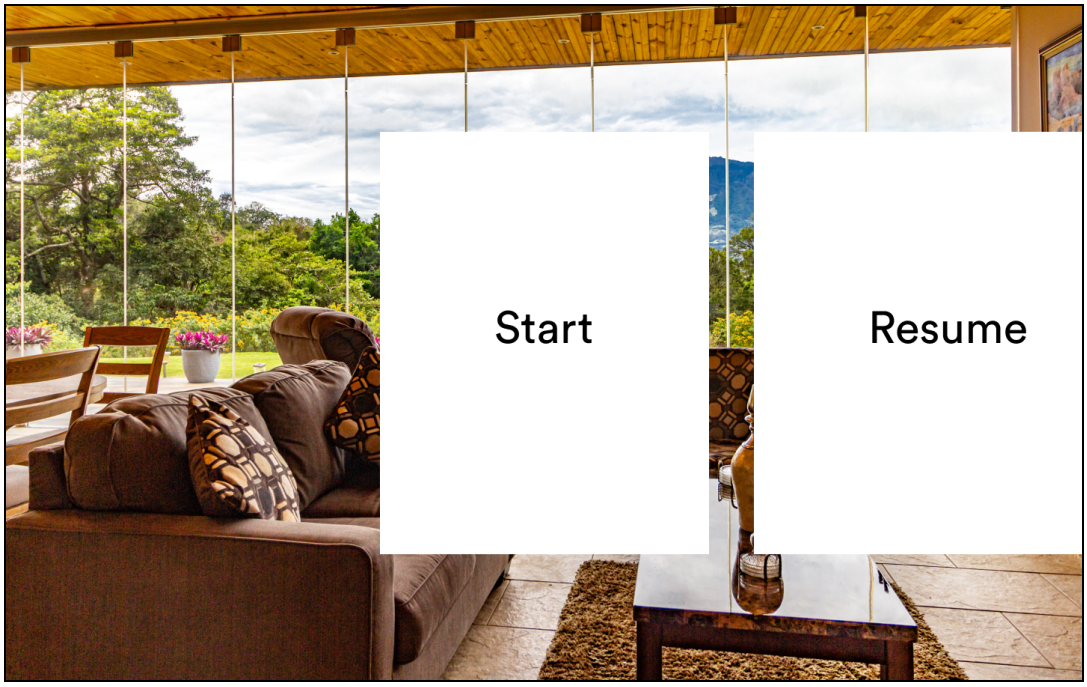
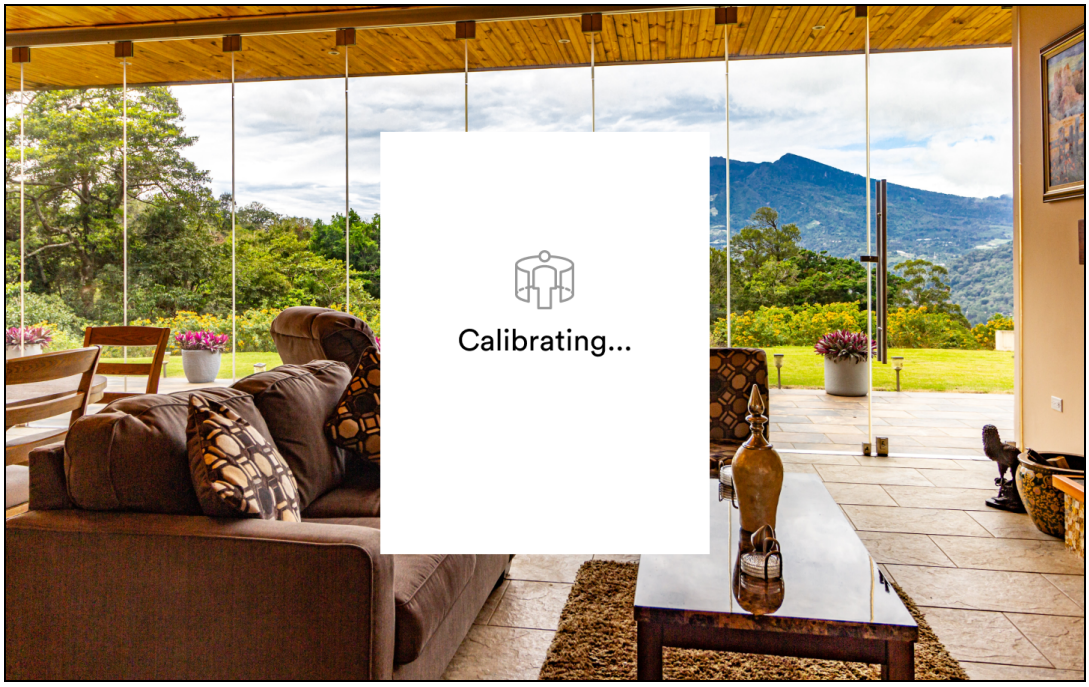
Fig 3.4 Low Fidelity prototypes for HoloLens 2

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