

Elderly friendly chair - *Furniture design*

by
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Guided by
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Approval Sheet

This project report entitled 'Elderly friendly chair' by Arjun Abhilash, 18U130006, is approved for partial fulfilment of the requirements for Bachelors of Design Degree.

Project Guide:

Chairperson:

Internal Examiner:

External Examiner:

Declaration

I declare that this written submission represents my ideas in my own words and where others' opinions or words have been included, I have adequately cited and referenced the sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated any idea/data/fact/source in my submission. I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been appropriately cited or from whom proper permission has not been taken when needed.

A handwritten signature in black ink, appearing to be 'Arjun Abhilash', with a long diagonal stroke extending from the bottom right.

Arjun Abhilash
18U130006

Acknowledgment

This project would not have been possible without the help and assistance of many people. I would like to thank Prof. Chakravarthy for guiding me throughout the course of the project and to all the professors for their feedback and guidance. The feedback during each stage of the project helped me immensely to shape the project in the right direction. I would like to thank all the lab assistants in IDC, especially Deepak Sir who helped me with prototyping. I would also like to thank my family and friends, without whom this wouldn't have been possible.

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Abstract

For project 2, I decided to work on furniture for the elderly. After discussion with my guide, the project evolved into Chairs for the elderly. For this, I took interviews of the elderly and also did my share of secondary research. After I did my primary and secondary research, I got a lot of insights. This helped me to come up with my brief - Design a chair for the elderly, which is very easy to get in and out of and is also very comfortable. Then I proceed to do ideation and from the ideation came the concepts. Then I made mockups of the concepts and the final design of the chair was also ready. Then I made a full-size working rig to test.

Project Area

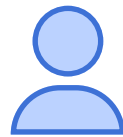
With old age comes wisdom, experience, and a whole new set of challenges. So, it becomes important that we create an environment that allows them to overcome any challenges without any discomfort. One smart way of doing this is by providing them with senior citizen-friendly furniture.

I think furniture for older people should be like shoes for younger people because they spend most of their time with them. I started thinking about elderly furniture when I saw my grandparents move their chairs, which they use to watch TV to the lawn to enjoy their evening. It was a big task for them to move it around. Even plastic chairs are not easy to carry around.

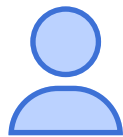
As a result, I decided that I am going to intervene here and design furniture for old people and make sitting and using furniture more comfortable and easy.



MALE 88



FEMALE 77



MALE 79



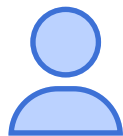
FEMALE 73



MALE 56



MALE 67



FEMALE 69

Primary Research

7 Interviews

4 Men

3 Women

As a part of my primary research, I interviewed 7 elderly people who were at different stages of their life, between the ages of 56 and 88. The questions asked in the interview were very simple.

- Their favorite chair/chairs
- Why do they like their favorite chair
- How long do they use chairs
- Different kinds of activities they do using chairs
- Where and when do they experience pain, if any

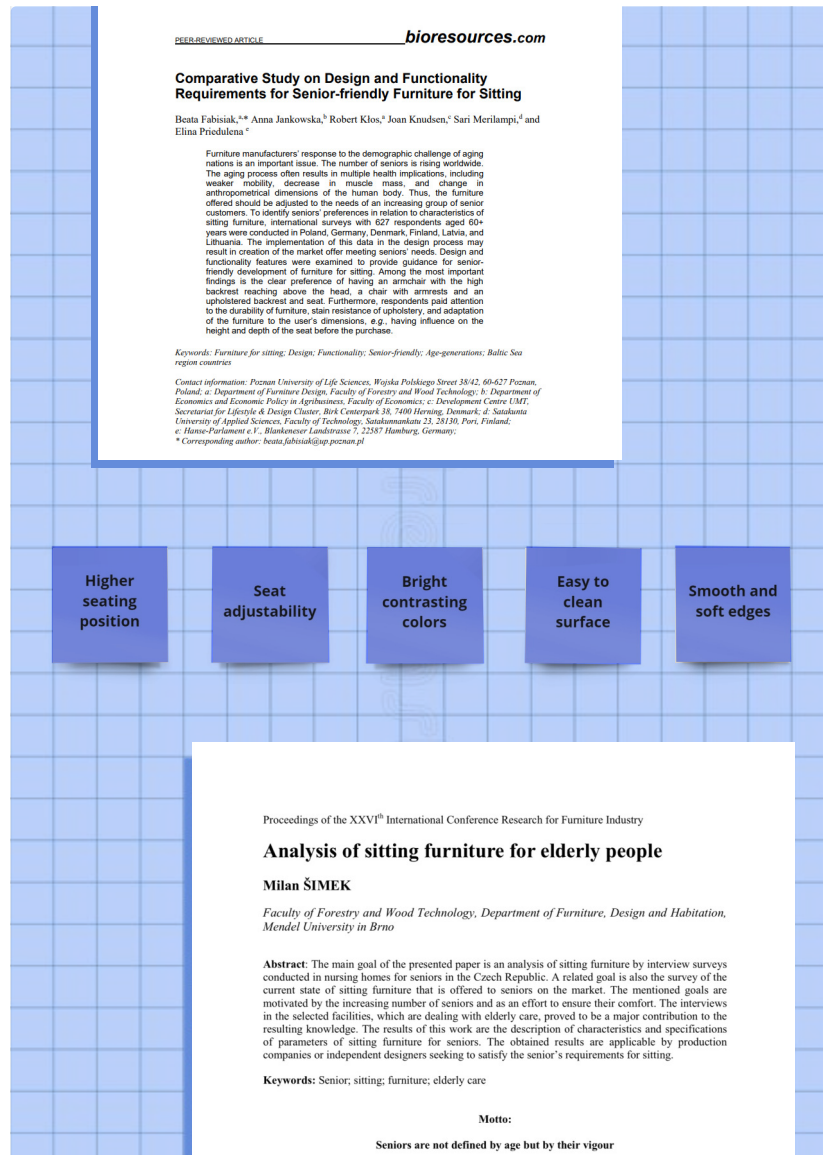




Insights from interviews

I received a lot of valuable insights from the interviews. The interesting insight was the preference for chairs varies from person to person. But one of the recurring observations was that sometimes they find it hard to get up from a chair. Also, most of them preferred a very tall and upright chair with an armrest for this reason. But these chairs aren't always the most comfortable if they want to take an afternoon nap or sit for a longer period of time. Most of them also preferred a chair that had cushioning, but shouldn't sink in if they sit down.

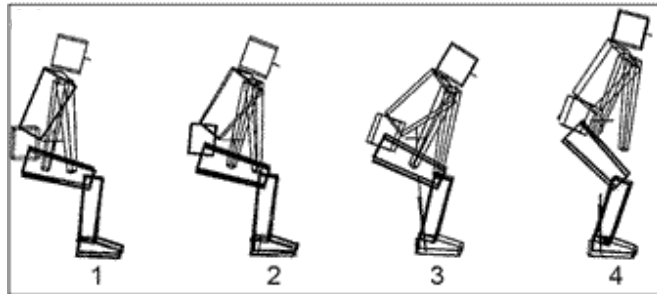
Watching TV and reading newspapers was one of the most frequent activity they did with the chair. As a result, they sometimes misplace the remote when they are watching TV, and find it difficult. Moving the chair around easily was also one of the insights.



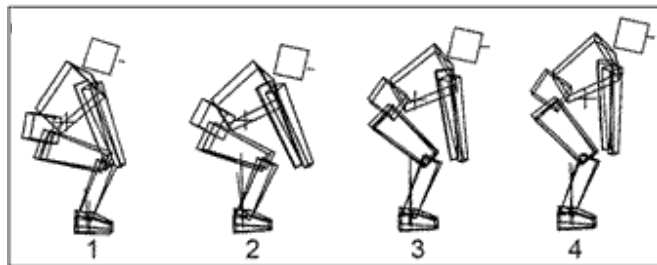
Literature Review

After reading multiple papers and articles about elderly furniture, I got a better idea about the situation. Elderly furniture should have higher seating positions and a fair amount of seat adjustability. Use of bright contrasting colors for people with poor eyesight. The higher seating position is essential for them to quickly get up from their chair. The seat depth was also an important factor. The lesser the seat depth, the better it is for getting up from the chair. Also, appropriate seating encourages good postural stability and support while reducing pain, fatigue, venous thrombosis (VT) risk, and pressure sores. Good seating may also encourage social interaction, and improve respiratory function and intake of food and drink. Inappropriate seating, however, reduces independence by increasing reliance on others. Poor seating can also simply be uncomfortable, and particularly in older adults with cognitive impairments, discomfort can lead to frustration and behavioral issues.

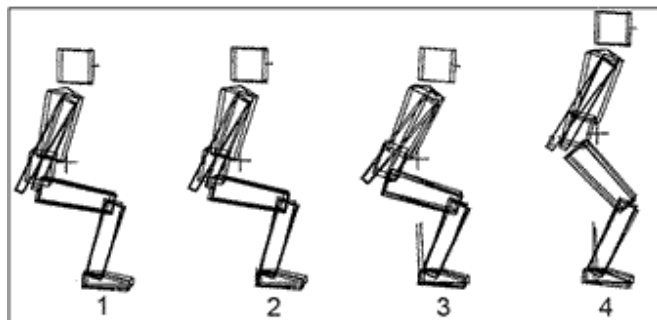
Sit-To-Stand Transfer



MT



ETF



DVR

I also got to learn a lot about sit-to-stand transfer and its importance while designing chairs for the elderly because the act of standing from a seated position is a physical task performed regularly throughout the day and is one of the most important measures of physical function. It is often referred to as chair-rise, or sit-to-stand (STS) transfer, this ability is key to maintaining mobility and independence and has been identified as the most important factor for older people when choosing a chair.

Biomechanically, rising from a chair is perhaps one of the toughest tasks and involves moving from a static, seated position through an unstable transition phase, to a 'quasi-static' (standing) position. Successful transition requires significant motor control, momentum, and coordination. There are a number of strategies to perform the STS like momentum transfer (MT), stabilization (or exaggerated trunk flexion, ETF), and dominant vertical rise (DVR). I also understood that momentum transfer is the most commonly observed strategy among the elderly since its the easiest and most efficient.



EURODIVANI Orthopaedic
High Seat Chair (21" seat
height)



Amazon Brand – Ravenna
Home Albert Power-Lift
Assist Recliner Chair,
34.3"W, Dark Brown



Extra Large Rocking Chair
Elderly Gifts Stable
Ergonomic Garden Deck
Chairs for Elderly

Market Study

I also did some market study on the type of chairs that are available for the elderly and which are usually associated with older people. Most of them just cater to either comfort or ease of getting up from the chair. Also, most of them are very big and bulky.

Objective

Design a chair for elderly between the age 70 to 80, which is very easy to get in and out of and is also very comfortable.

Design Brief

- Comfortable and for a prolonged sitting of more than 2 hours
- An aid for getting up from the chair
- Biller material cost around Rs 6000
- Selling cost around Rs 12000
- Traditional aesthetics to appeal the elderly



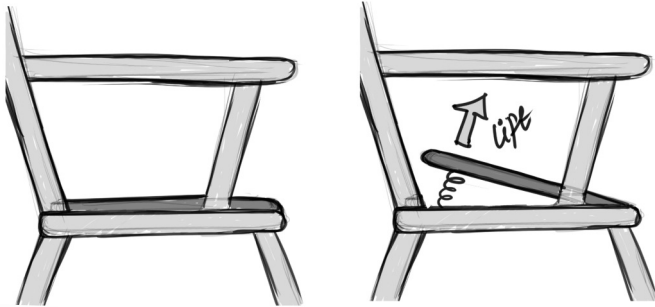
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Ideation

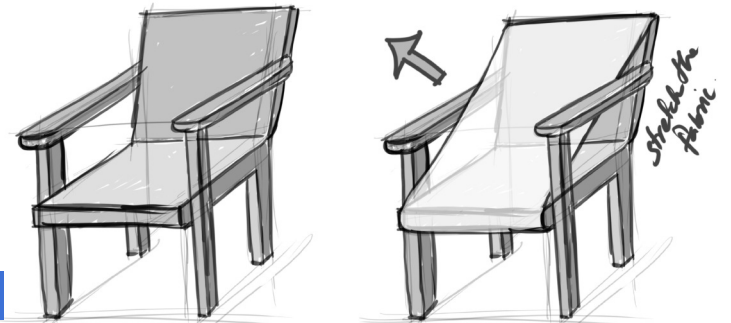
I started my ideation process by sketching out a variety of different ideas. The main objective was to develop a diverse set of ideas and then cluster them into concepts later. Most of the ideas developed were catered towards the ease of getting in and out of the chair.

- 1 Explored how the shape of the armrest can help in applying pressure while getting up.
- 2 A loaded mechanism to push you up while trying to get up
- 3 Stretching cloth to help get up
- 5 Retractable leg
- 6 Buttons and using armrests to control the motion
- 7 Rocking mechanism

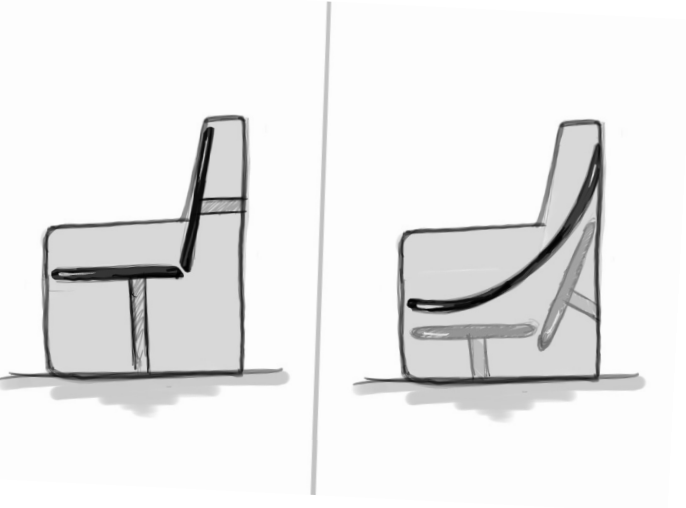
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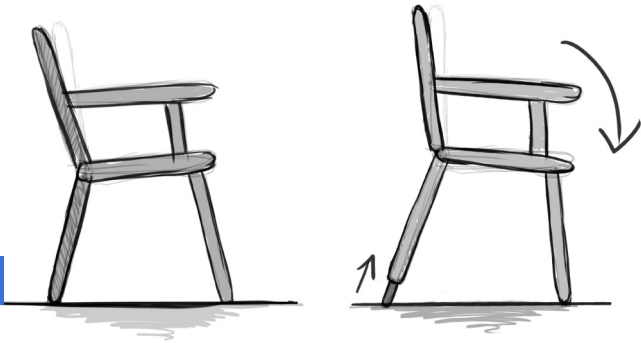
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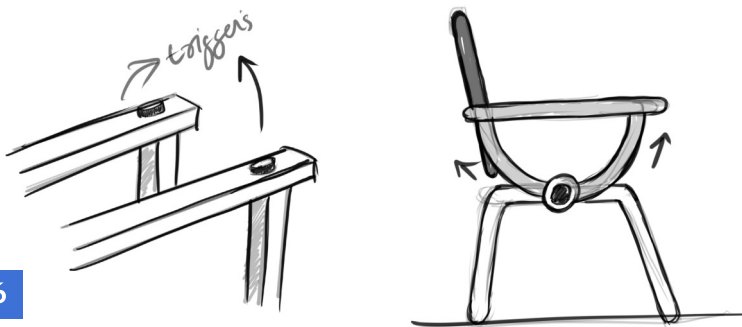
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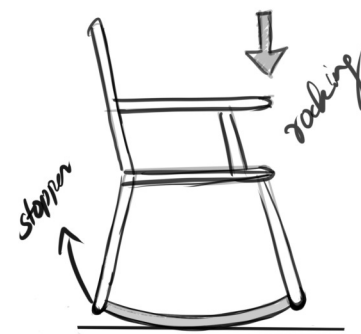
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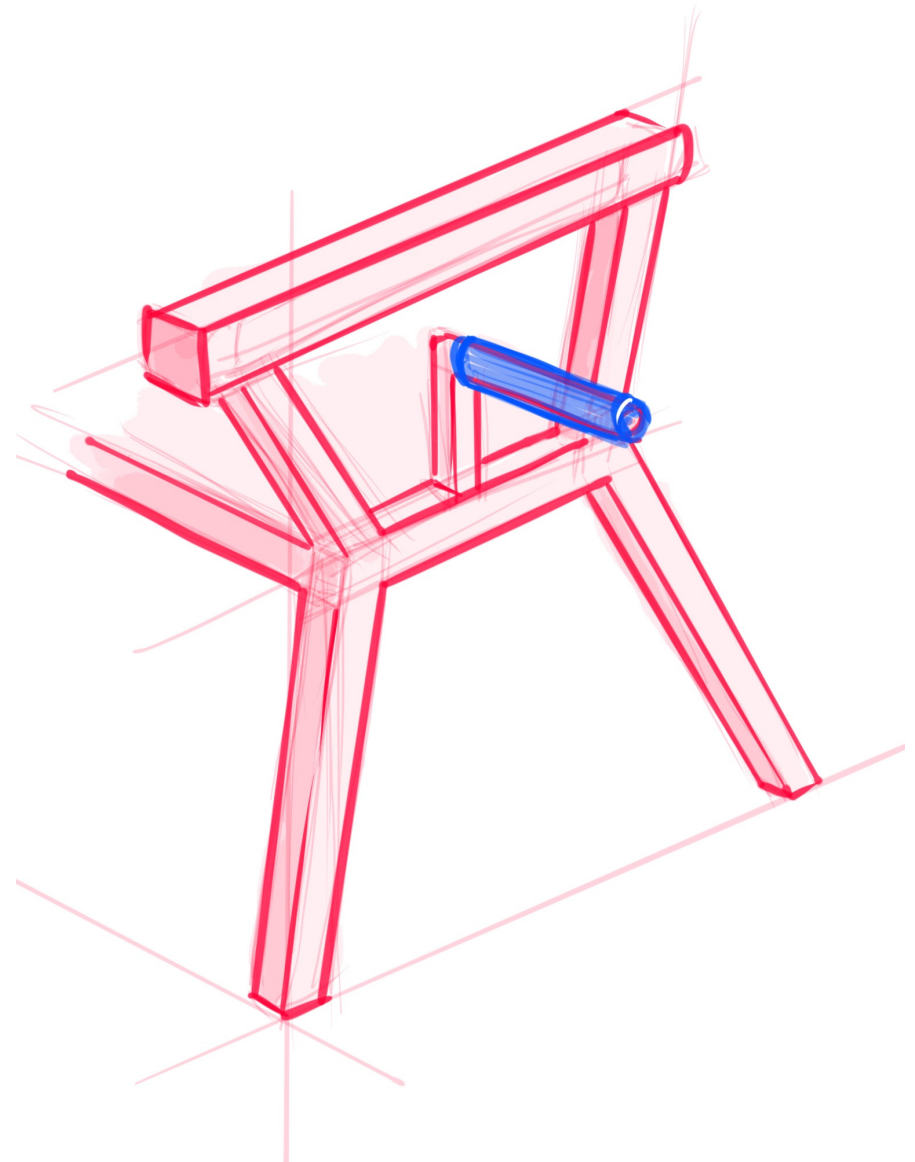
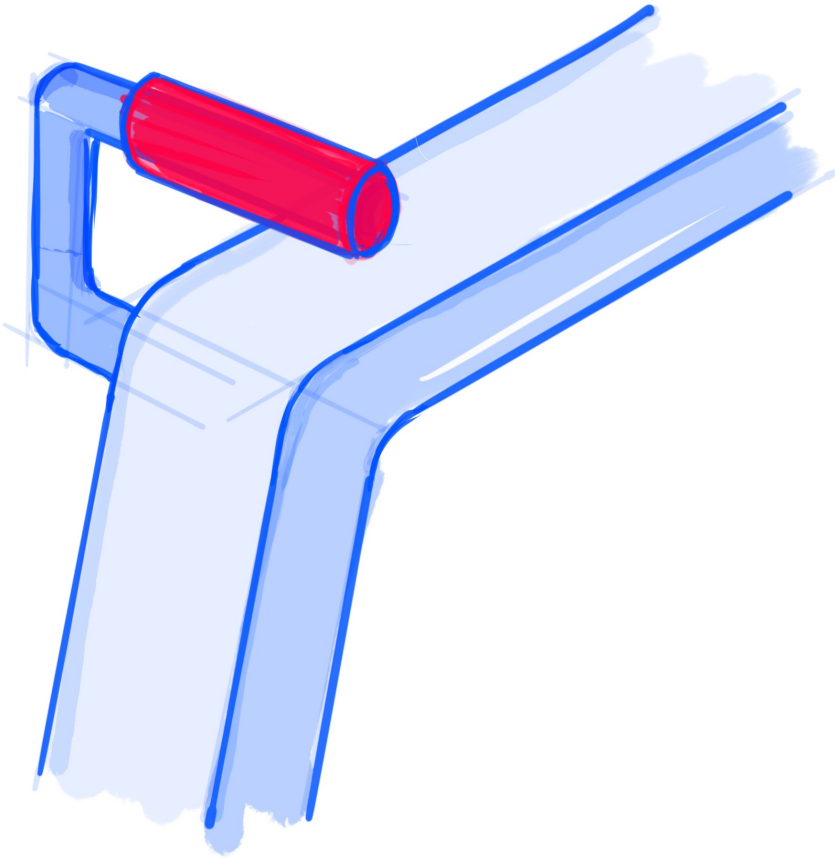


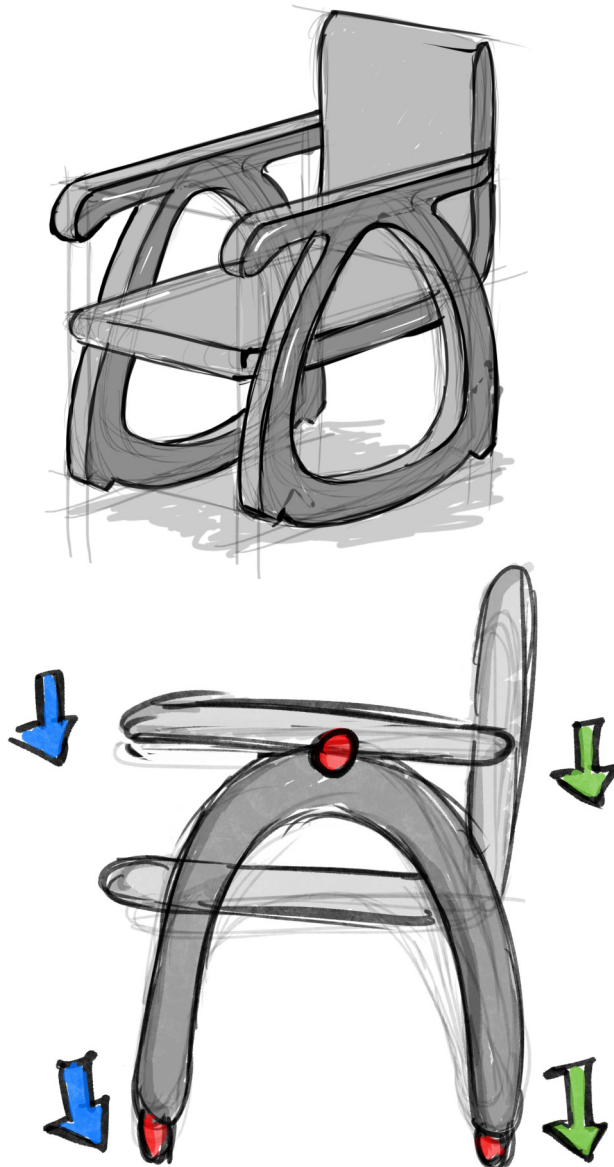
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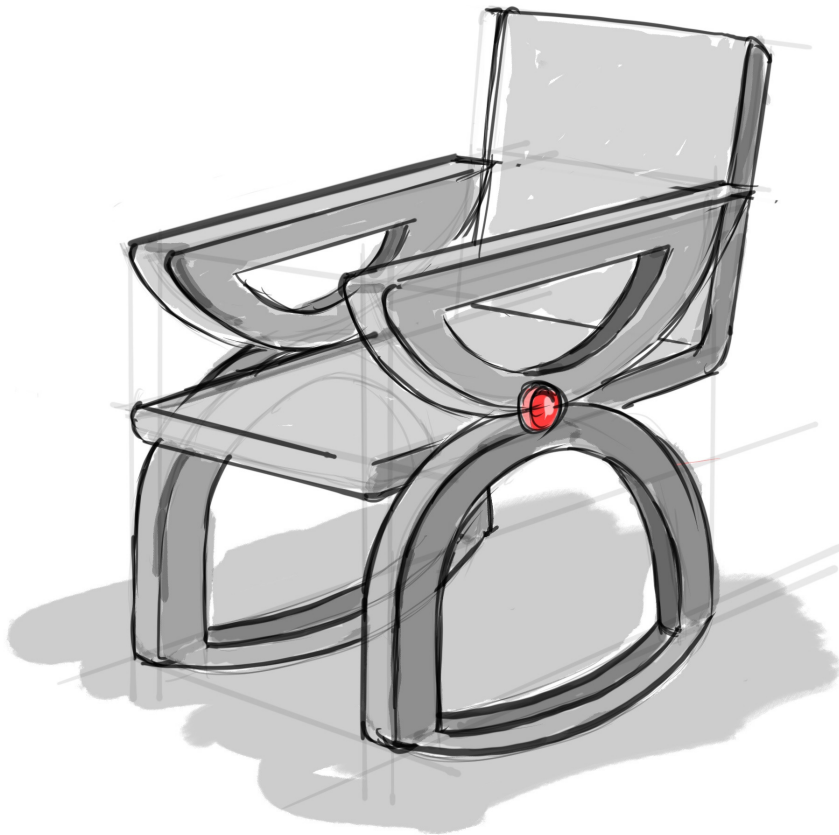
Concept

Once I was done with idea generation, I had a bunch of ideas to play around with. The idea of a rocking chair to help elders get in and out was very interesting, so I explored more in that direction. The main idea behind this is transferring the weight in the right direction to help you get up from the chair.

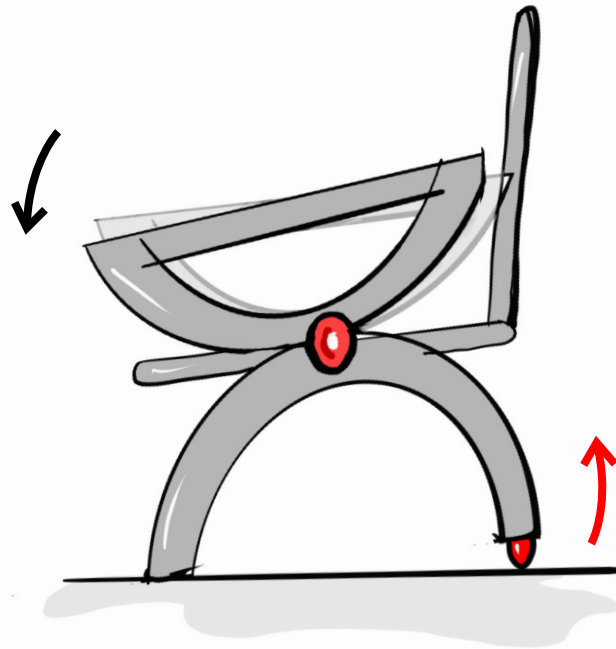
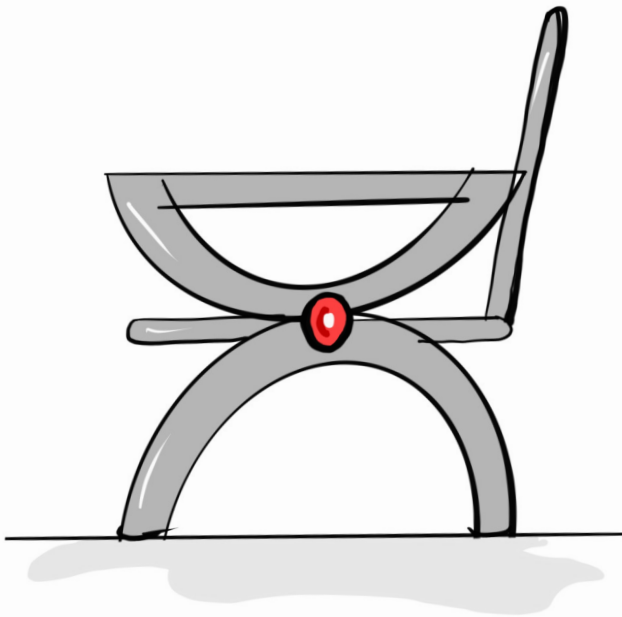
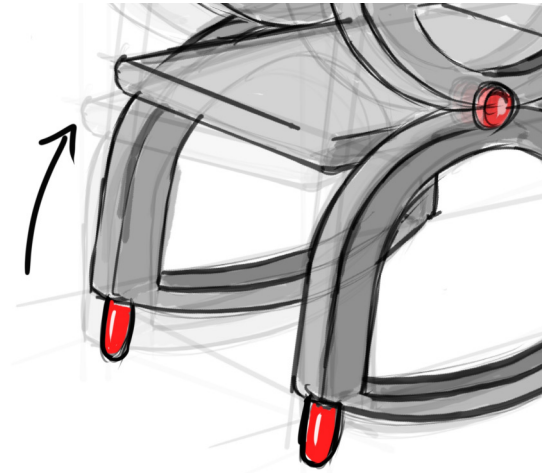
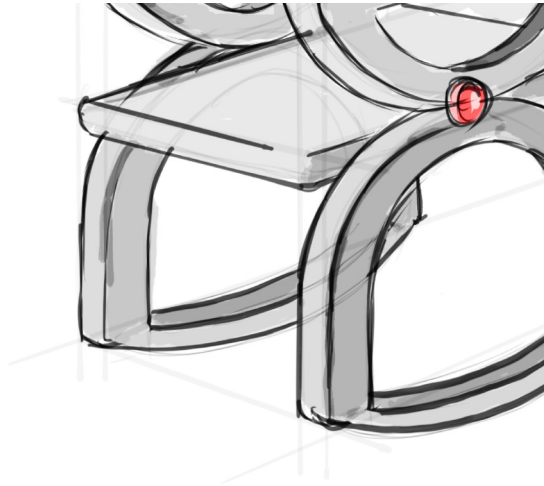
The challenge was how to control it. For this, I used the help of one of the other ideas, which was to use extensions from the legs of the chair. These extensions will be spring-loaded. They can be locked and unlocked to help with getting in and out of the chair. The elders can use their body weight to lower the springs and then lock them. If they want to get up, releasing the springs along with the rocking motion will help them have a better position to get up. The handrest can be used to operate the locking and unlocking of the spring-loaded extensions.

Initial Design

After the concept was done, I moved on to the final design of the chair. Like in the concept, the chair has a rocking mechanism along with spring-loaded legs. The armrest is used to control the movement of the extensions, which in turn aids the elderly to get up from the chair.



- Made out of wood to appeal to older people
- Aids elderly to get up from the chair
- Has a very comfortable seating position



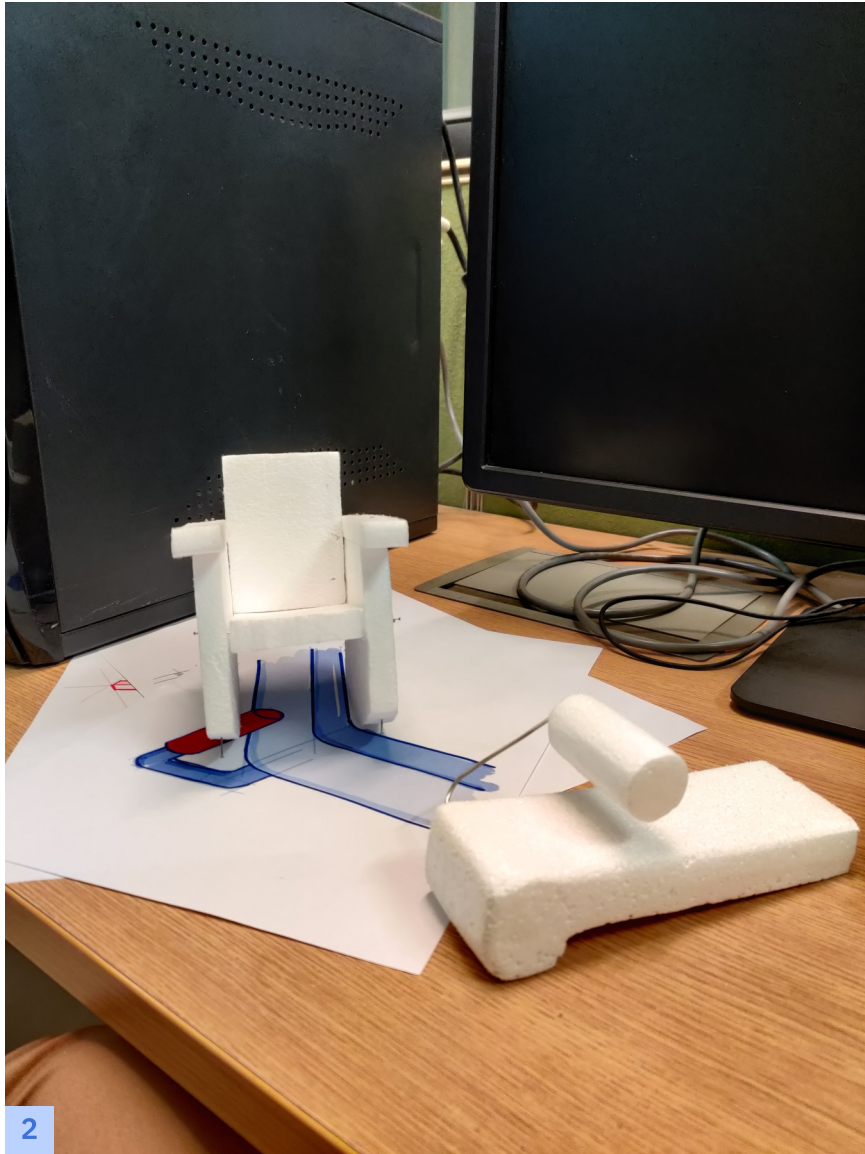


Mockups

The next step was to make mockups of the concept I came up with. Making mockups was necessary for me to bridge the gap between the sketches and the prototype I was planning to make. It will also help me understand the concept better and make necessary changes to it also.

I used thermocol and metal wire to make the mockups. The process of making them was very straightforward. I made 3 different mockups.

- 1 Thermocol and pin mockup of the rocking chair. The pins utilized leg extensions to control the rocking movement
- 2 Support on the handrest to help get up
- 3 Thermocol and wire are used to emulate the mechanism of the leg extensions





Working Rig

To prototype the working rig, I used an old office chair. To add the rocking mechanism, I cut out 2 pieces of wood and then shaped them to an even curve. Then the 2 pieces were attached to the base of the legs of the chair using a tap. Then I added a piece of wood to both the rear legs to help it balance itself and prevent it from toppling.

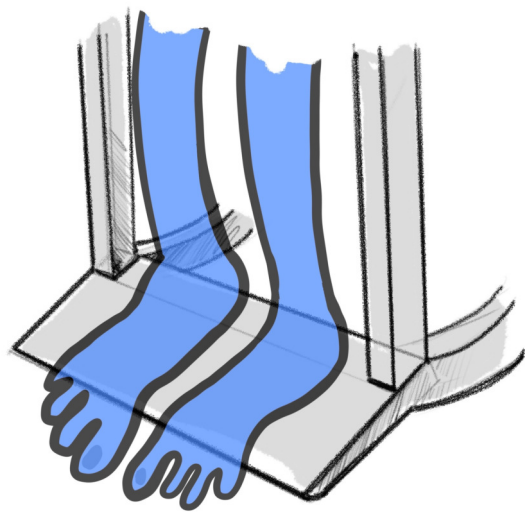
Then the rig was tested with help of a friend. The rocking mechanism was working perfectly. The technique to get was also working as expected. The rig was lacking the spring-loaded extensions to help it stay in place. This hindered further testing. After testing, I got a better understanding and have ideas to improve the design.





Updated Concept

After I got feedback for my initial concept, I realized that it wasn't very practical to go forward with. Then I went back to the drawing board. I still had the idea of a rocking mechanism that aids you to easily get up. I realized, I could just use a simple footboard, where the person can step on and then sit on the chair, instead of the complex mechanism using a spring. Here the idea was to use the weight of the person to tilt the chair in the right direction.



For this, I researched more extensively on rocking chairs. I got to learn about the simple formula used in making rocking chairs. But I realized that it wasn't really applicable to my concept, because the chair shouldn't rock when it isn't supposed to.



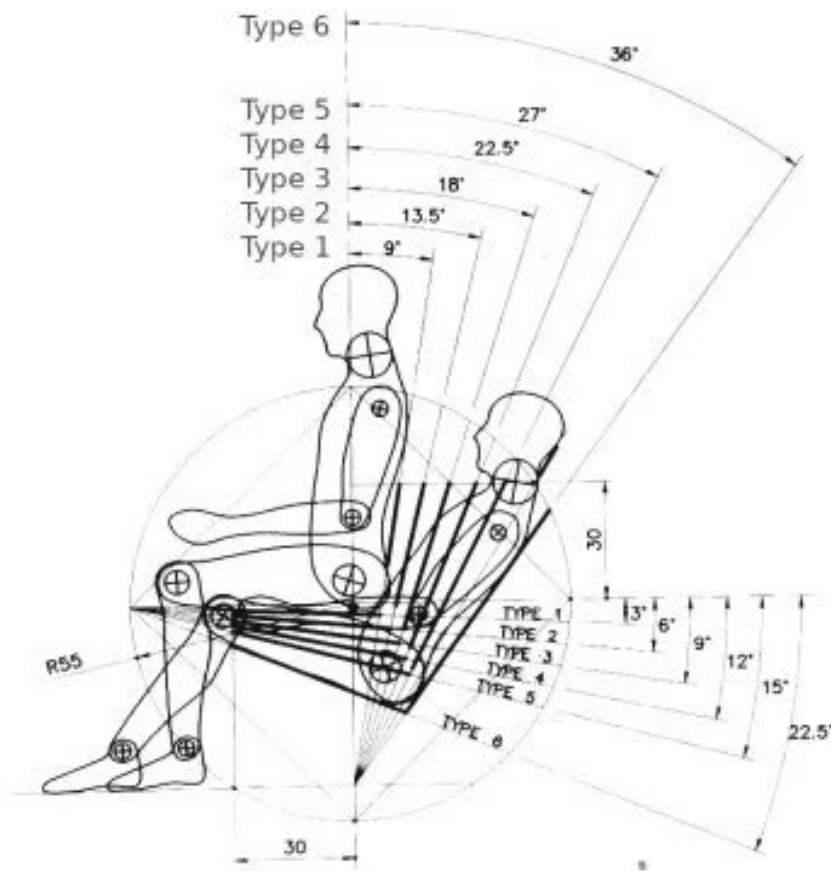
Updated Working Rig

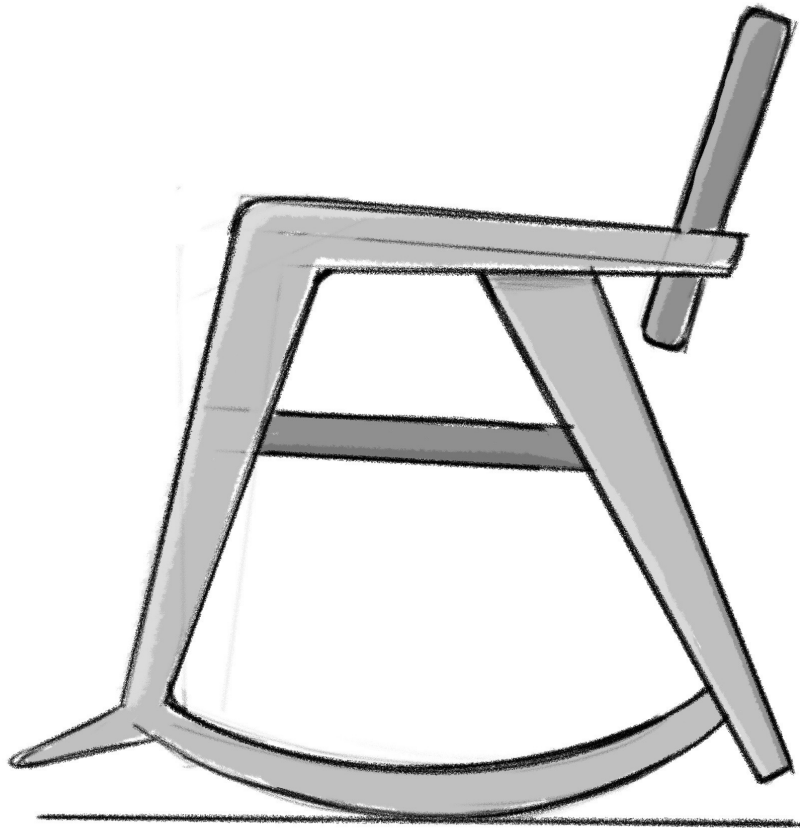
I updated my initial working rig by adding a footboard to it. The rig was still rocking perfectly. Now with the help of the footboard, I was able to step on it and make the chair tilt forward. As long I had my foot on it, I was able to sit on the chair which had a better angle for the seat. After sitting down, you can go to a more relaxed seating position, when it tilts backward. For getting up, I had to lean forward and apply pressure on the footboard, and was able to get up.

Further Research

The ideal angles for a chair

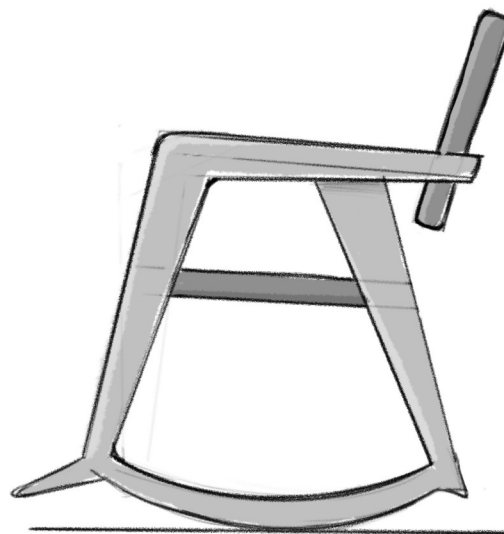
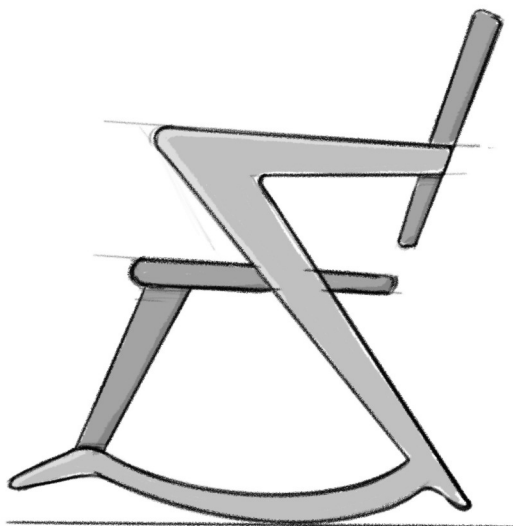
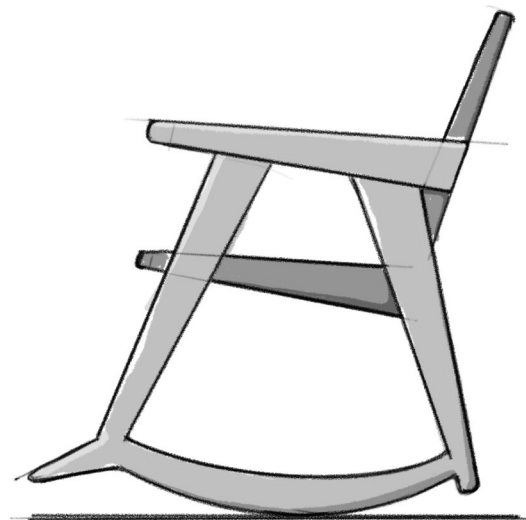
To get a better understanding of the ideal angles of the chair, I referred to the works of Dutch designer Andries van Onck. He proposed six types of sitting positions. In the first type the seat is almost horizontal (3°). This position is practical for eating, working at a desk, or getting up easily. At the other end of the spectrum is the sixth position with a very inclined seat (22°). The pressure is well distributed between the seat and backrest and blood circulation is as free as possible. This feeling is confirmed by clinical studies using pressure sensors on so-called pressure sore prevention mattresses. This position allows recovery by allowing the blood to circulate freely without putting too much strain on the heart. The second position is suitable for car seats. It allows the driver to keep his or her eyes on the road while offering an acceptable level of comfort. Positions 3, 4, and 5 are used for resting chairs depending on the activity.

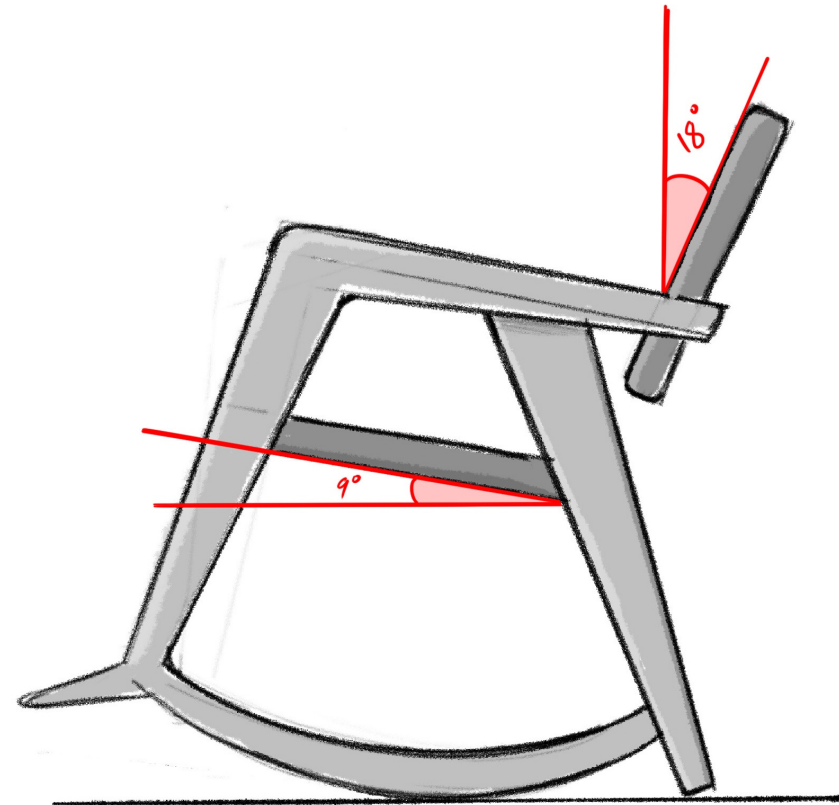
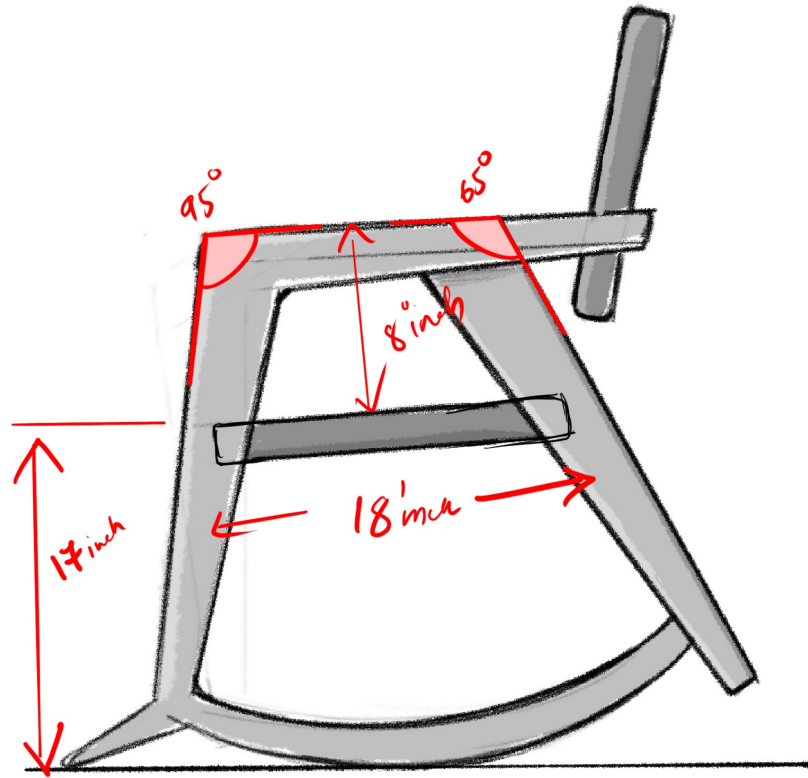




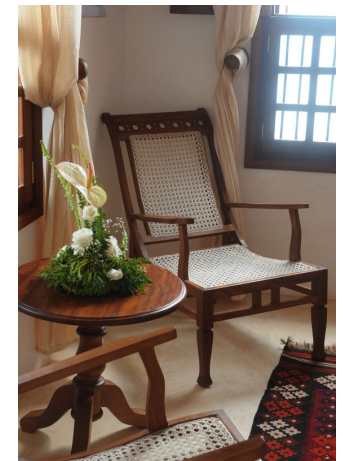
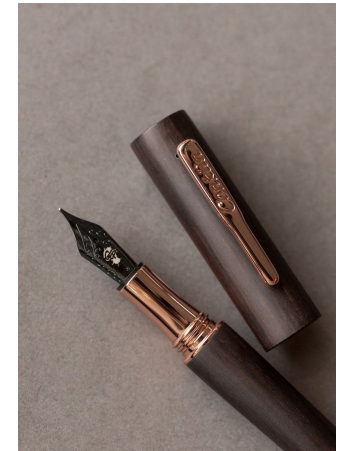
Final Design

Once I had my mood board, concept, and working rig, I was able to come up with my final design. For the final form of the chair, I was trying to make it appealing to the elderly. For this, the mood board helped me a lot. The final design consists of simple lines with soft and smooth edges. This was also important so that the elders won't get hurt by the edges. The works of Andries van Onck helped me choose the right angles for the chair. I went forward with position 3, which was centered on comfort.

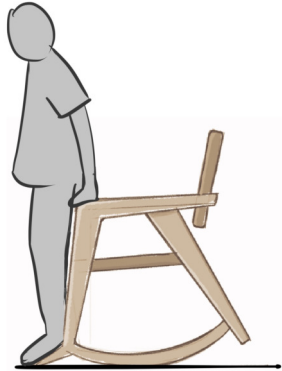




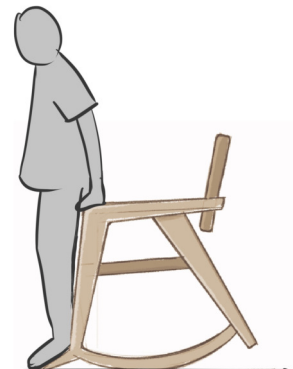
Moodboard



Scenario



Sitting Down



Standing Up

Renders



Conclusion

I chose the topic of chairs for the elderly after observing my grandparents. The project was very fun, even though there were ups and down throughout the journey. I got to learn about a lot of new things and read a lot of great articles and literature on the topic. The ideation and developing concepts were the most enjoyable part of the project because I was able to try a lot of new mechanisms and concepts that I have never tried before. I felt like my initial research could have been better, but to compensate for this, I was parallelly doing research during the later parts of the project. I was satisfied with the final design I was able to come up with. The next step will be to make a full-scale model of the chair and evaluate the design with the help of the elderly.

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