TANGIBLE 2-FACTOR AUTHENTICATION (T2FA)

Mark Turner

Supervised by Karola Marky

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Tangible authentication has been found to be more enjoyable for users, improving usability [7], but tend to rely on batteries or network connection

T2FA

[1] Assorted 3D-printed objects

Intended to improve on usability issues of 2FA

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3D printed objects using conductive and insulating plastic

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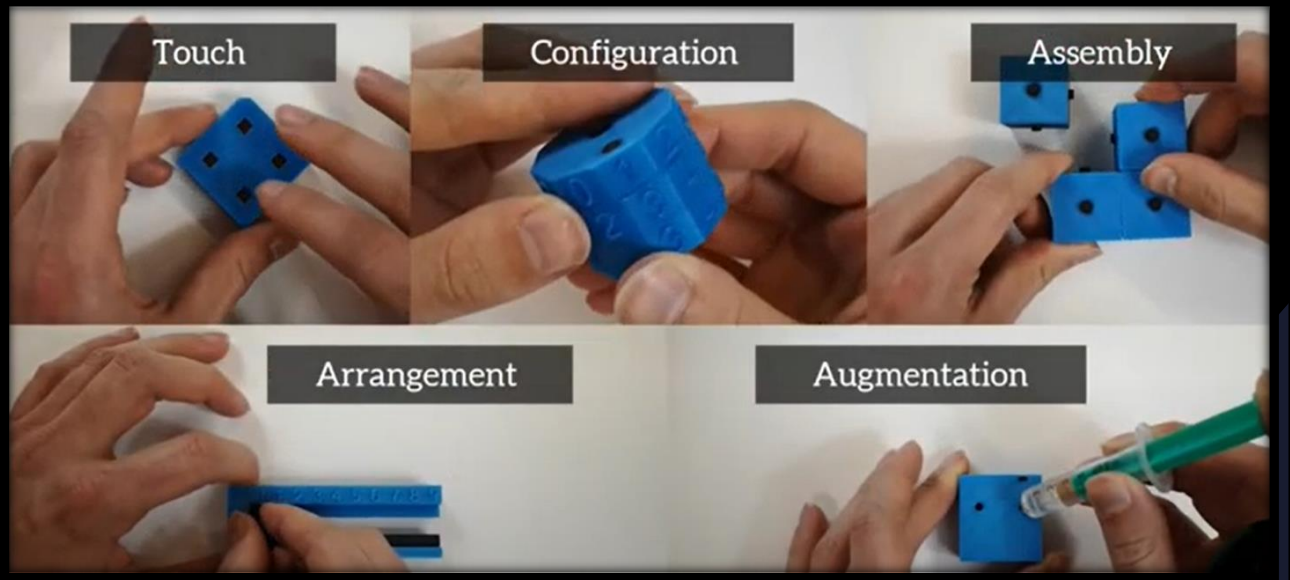
Method of interaction serving as knowledge factor, unique object ‘footprint’ as ownership factor

Don’t rely on batteries – powered by your fingers

T2FA and 3D-Auth

3D Auth: Two-Factor Authentication with Personalized 3D-Printed Items [3]



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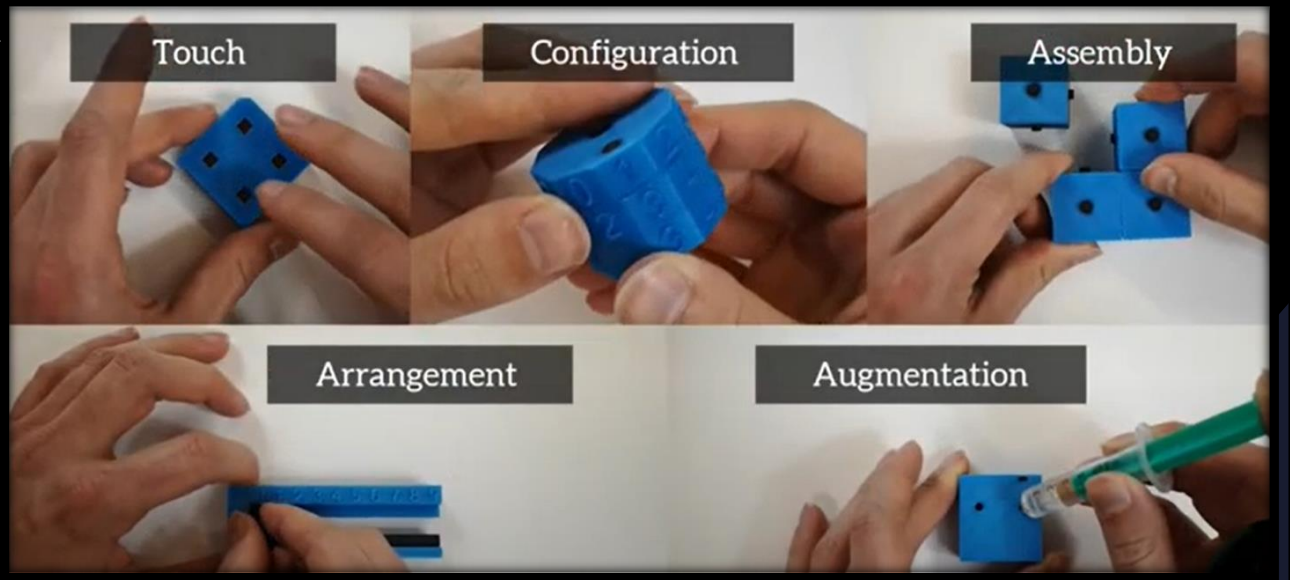
3D Auth: Two-Factor Authentication with Personalized 3D-Printed Items

80% of interactions performed successfully in the lab study



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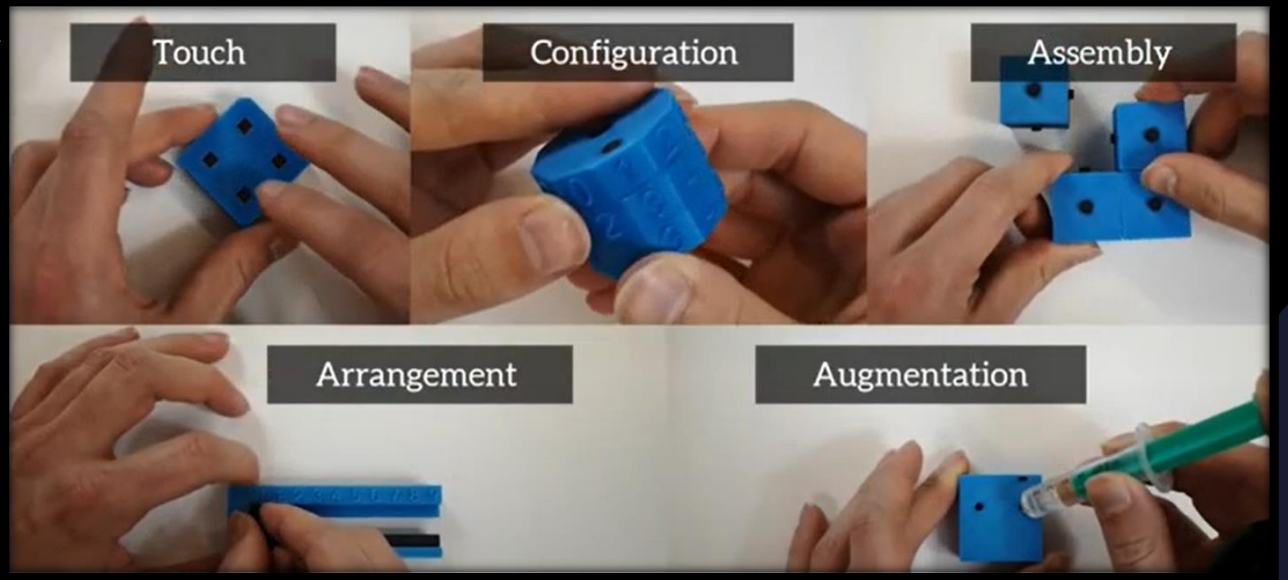
User experience survey indicated neutral or positive evaluations for each area of usability



Existing Online Survey

Analysed in order to find desirable traits
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Object shape	Number of responses
Cube	17
Circle/coin	13
Credit card/Rectangle	11
Square	7
Wearable (ring)	5
Animal	4
Necklace	2
Keyring	2
Phone case	2
Car key	1
Polygon	1
Cylinder	1
Fidget Spinner	1
Car	1

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Size (cm)	Number of responses
1	4
2	8
3	19
4	4
5	34
6	7
7	3
8	4
10	26
12	2
13	1
15	8
20	2
30	3
45	1
50	1

New Models

Initial ideas sketched

New Models

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Interactions added

New Models

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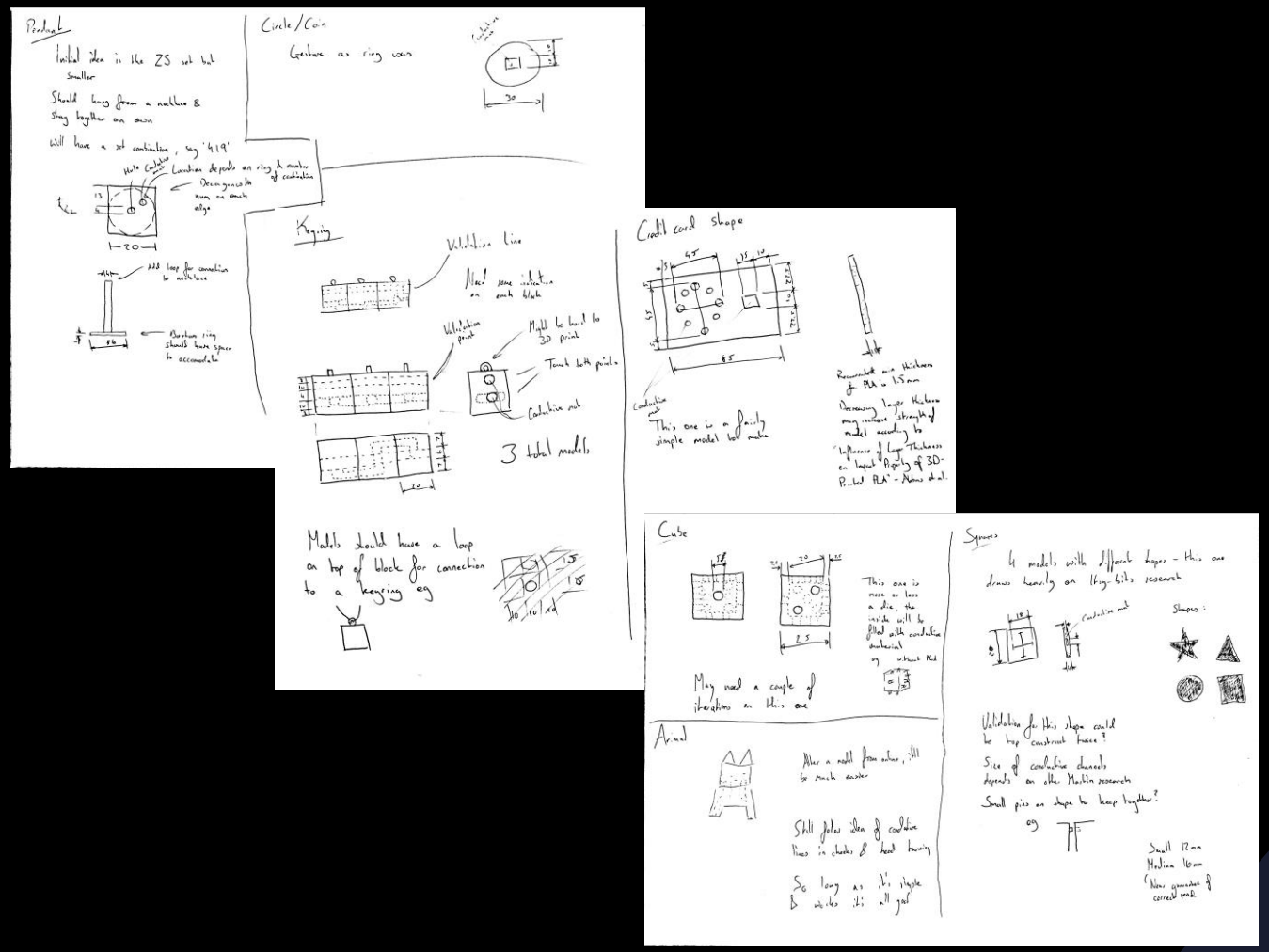
Production drawings created



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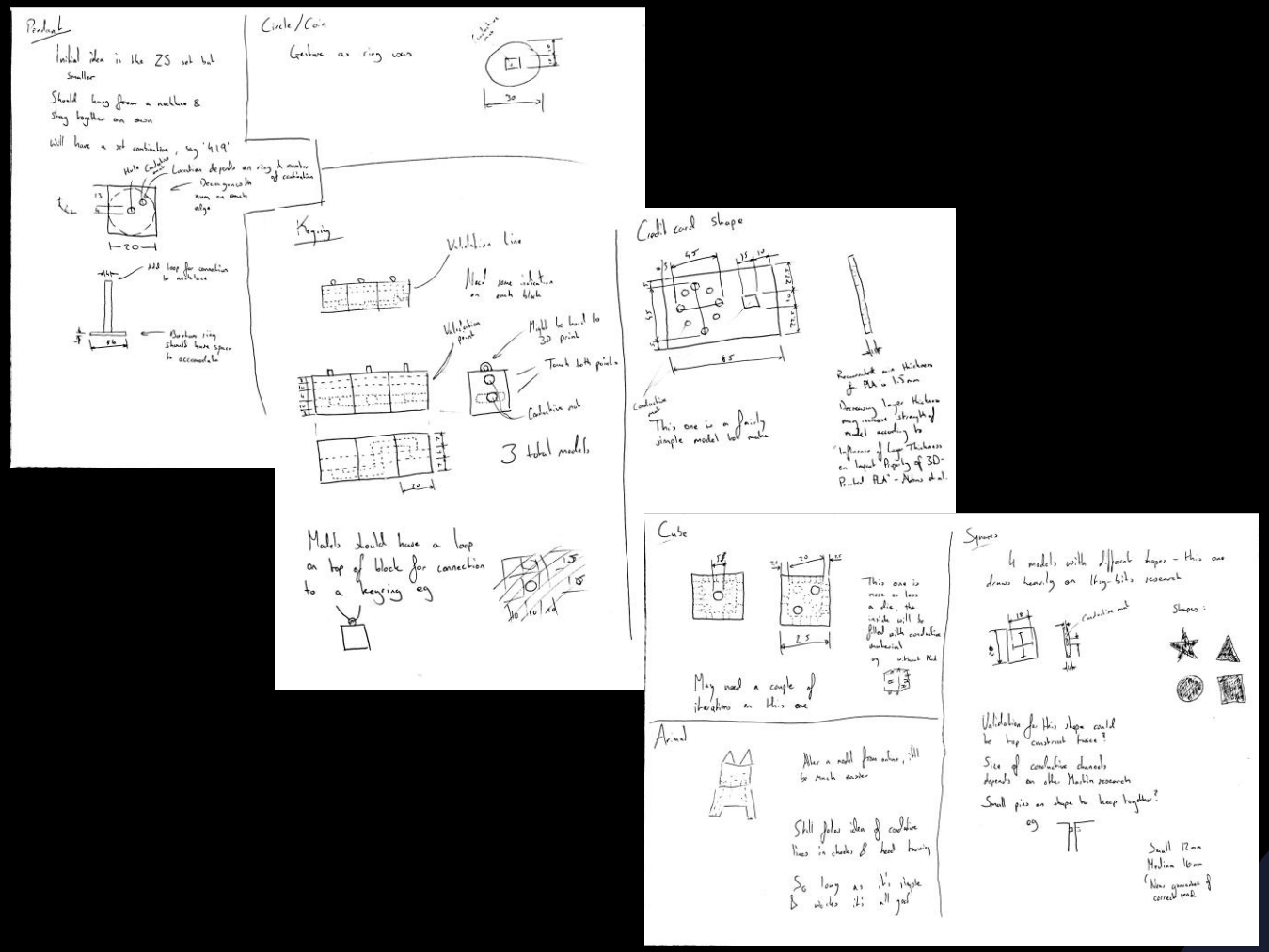

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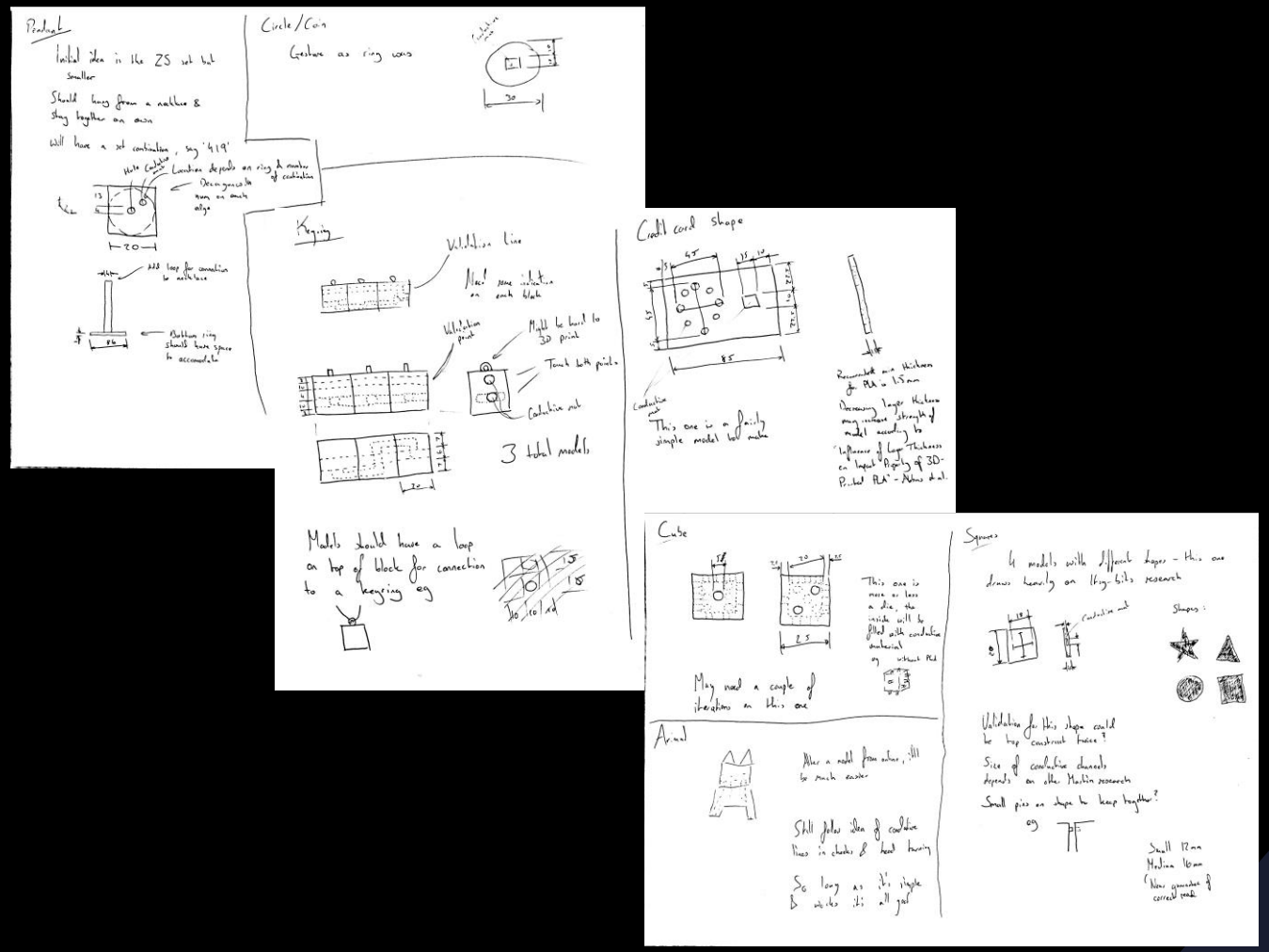
Digital models created



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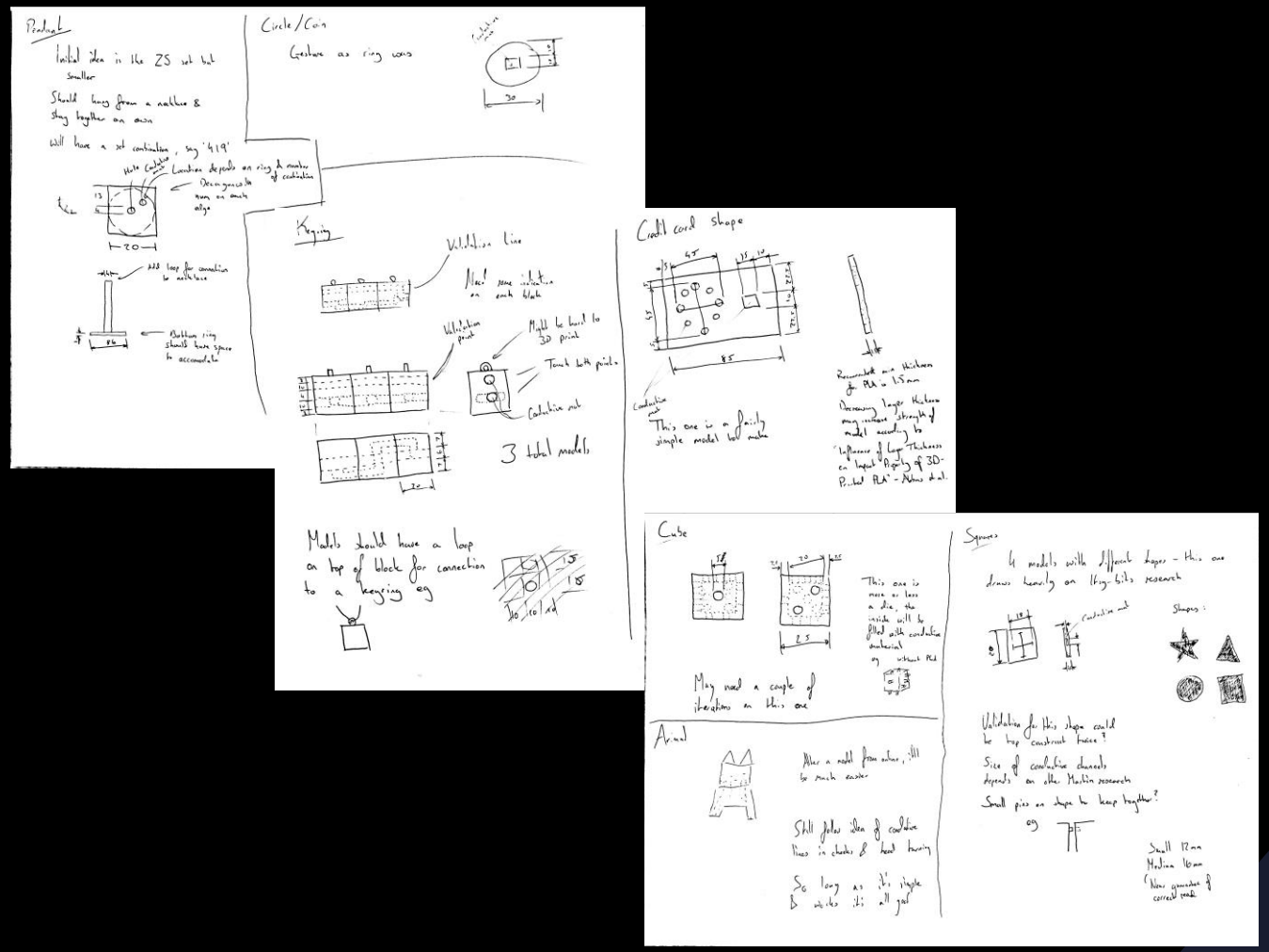

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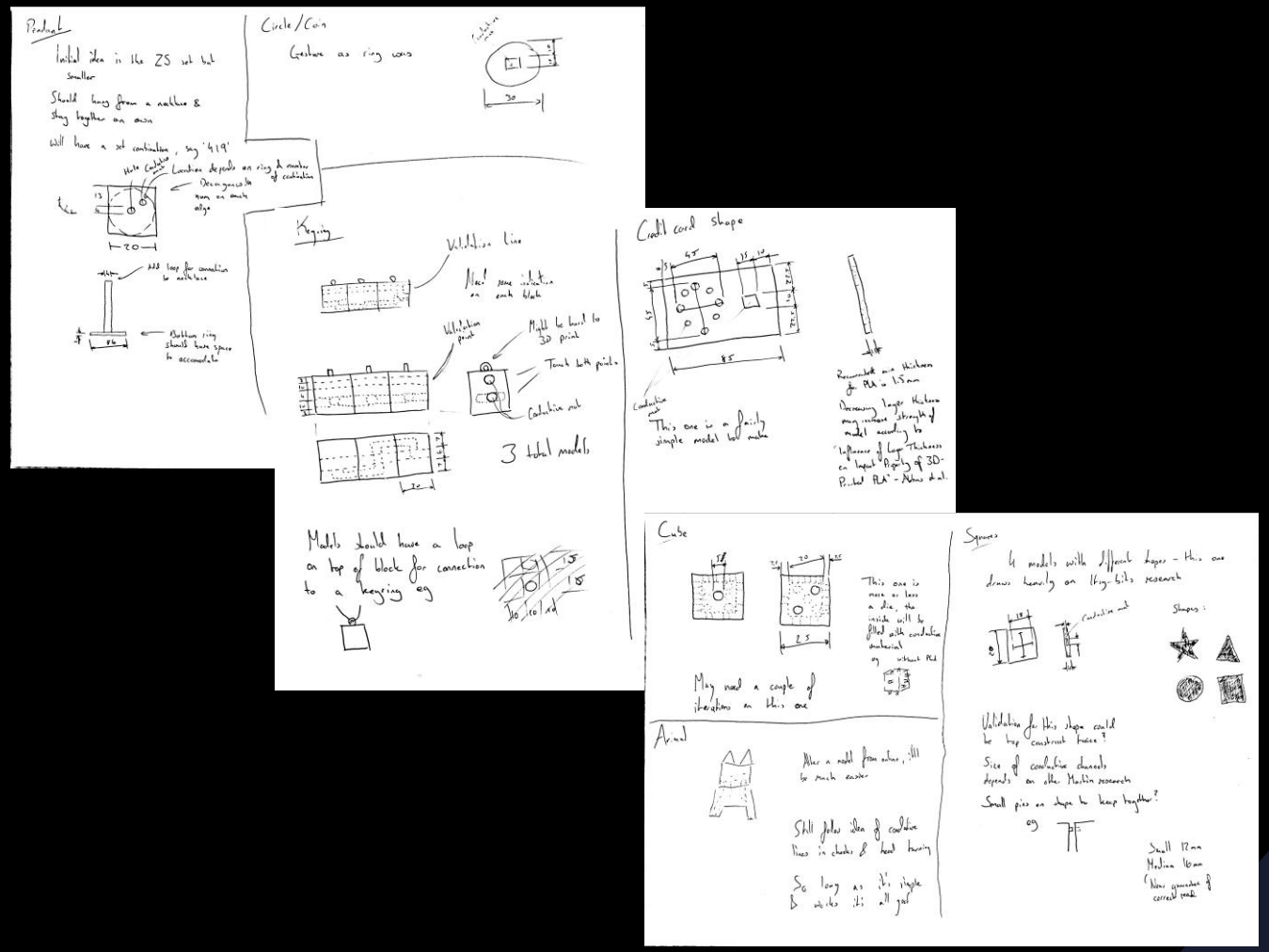
First filter

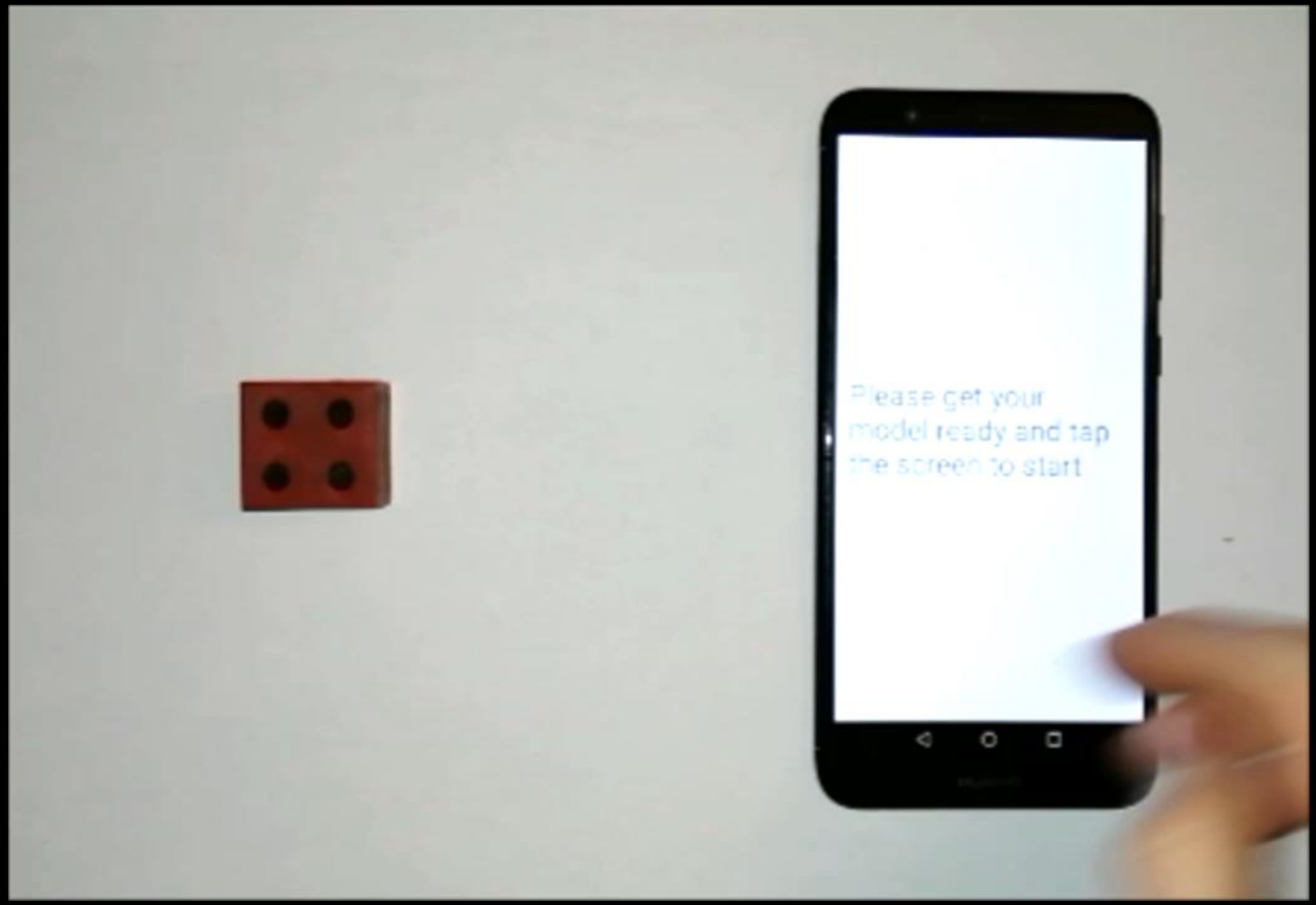
Digital models created

Second filter

Final digital models



Demonstration



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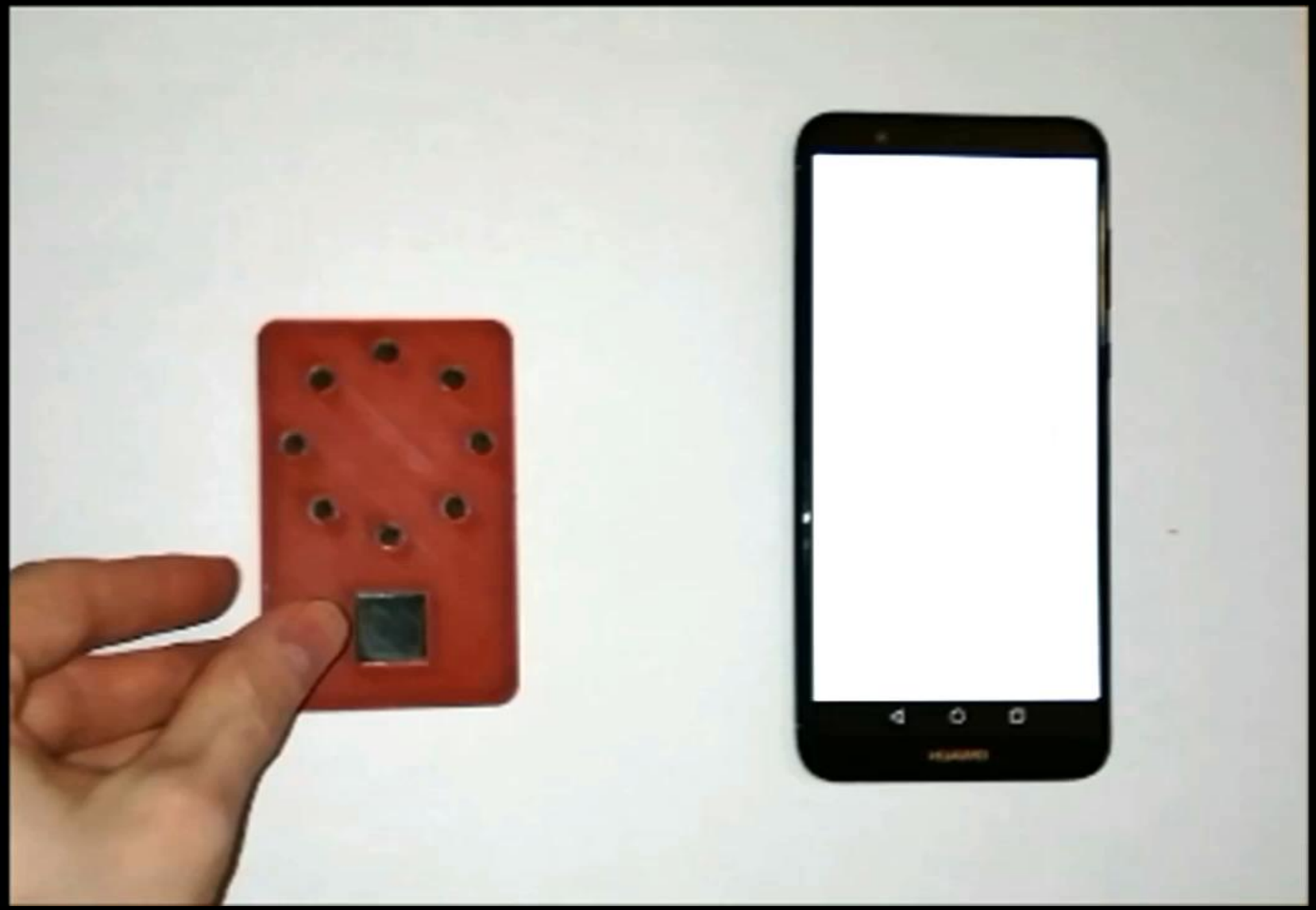

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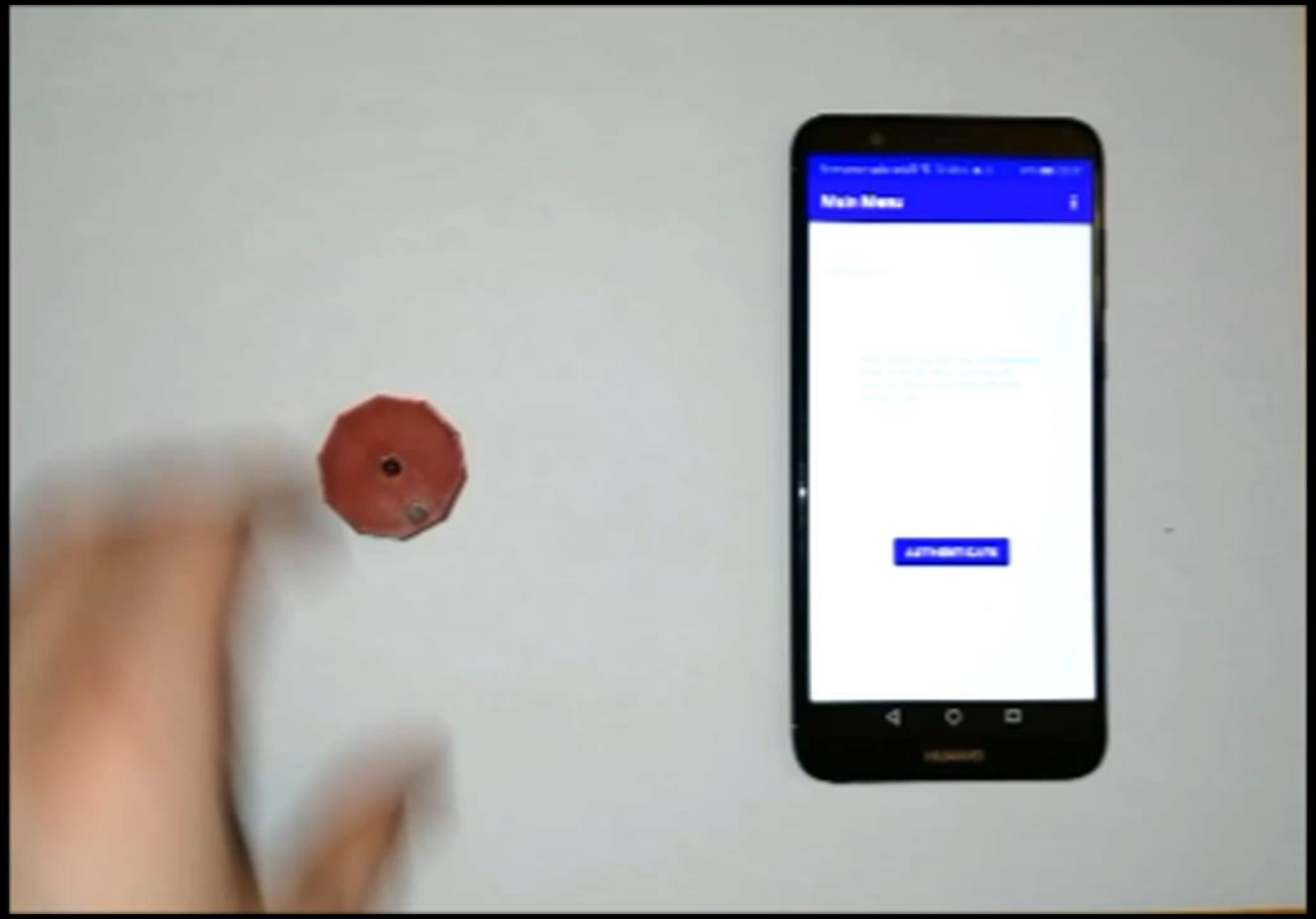

Study app

Notification, data collection and interaction verification

[2] Android logo

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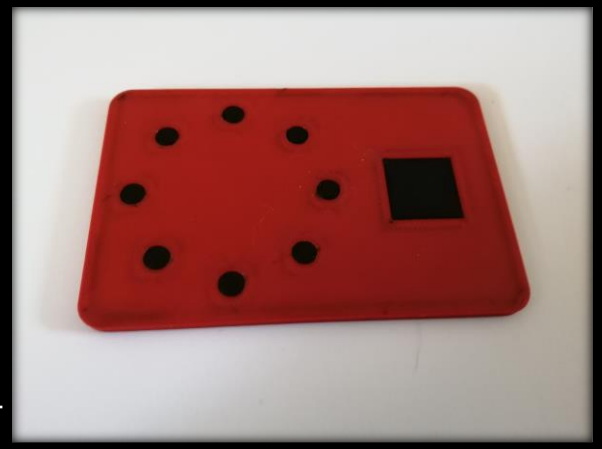
MotionEvent.getHistoricalPoints()

MotionEvent.getSize()

Study

Initial meeting – demographics survey, model assigned and familiarised, contents of study explained



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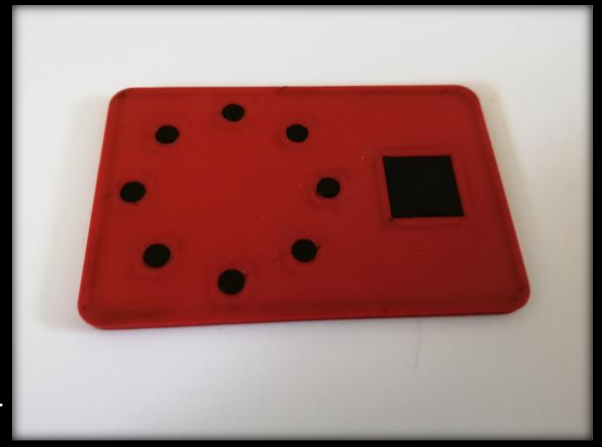
Minimum of 2 mock authentications per day for one week

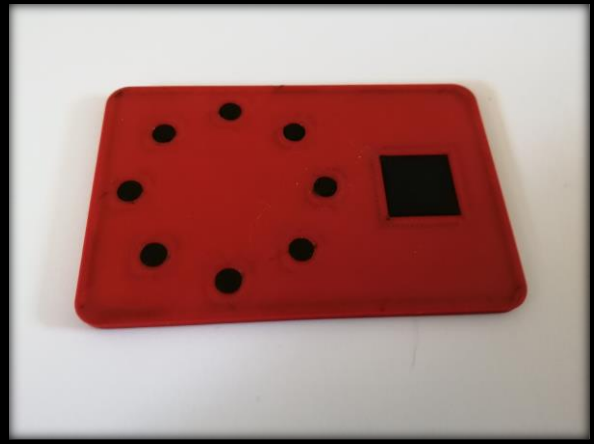


Study

Initial meeting – demographics survey, model assigned and familiarised, contents of study explained

Minimum of 2 mock authentications per day for one week

Exit meeting – SUS survey, introduction to other models, exit interview and app data collection



Results

ID	Object	SUS	Mean Time (s)	SD	Success Rate (Attempt)	Success Rate (Authentication)
1	Cube	60	8.09	3.67	15.00	38.71
2	Card	52.5	5.16	2.68	53.66	88.00
3	Pendant	60	5.47	3.49	23.40	61.11

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"Sometimes the authentication just wouldn't go through" (P3)

"I'm not sure if smart phones [are] the best place to use it" (P2)

"It's a nice and fun [...] interaction" (P1)

Limitations

Low number of participants

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Faulty study app

Future Research

Perhaps stationary devices over portable devices should be considered

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Utilise raw capacitive data rather than OS functions

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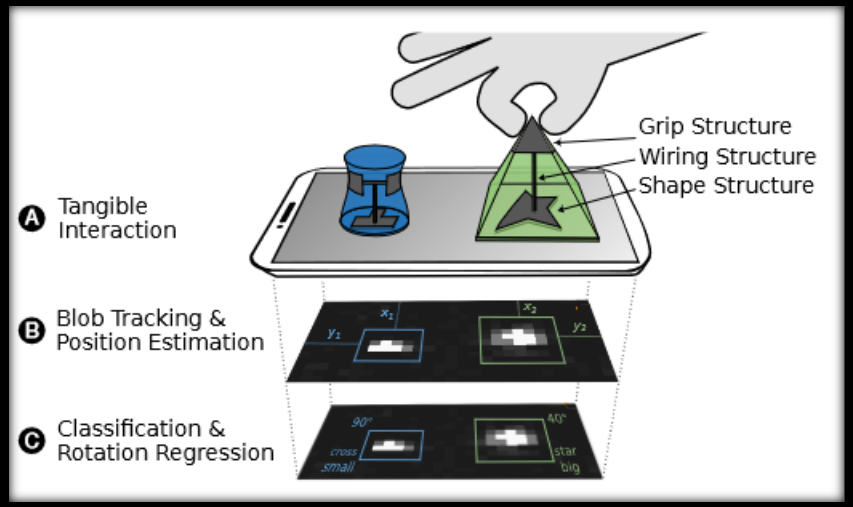

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Potential for highly customizable and secure objects

[3] Potential future object

Conclusion

Very promising method, with participants eager to use in future

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Very promising method, with participants eager to use in future

Issues were unearthed however, and limitations exist in this study, so further research is needed

Thank you

References:

[1] S. Frey. 2017. What Does Resolution Mean for SLA Printers?. Image. Retrieved from: https://theorthocosmos.com/what-does-resolution-mean-for-sla-printers/

[2] Android Logo. 2022. Image. Retrieved from: https://1000logos.net/android-logo/

[3] K. Marky, M. Schmitz, V. Zimmermann, M. Herbers, K. Kunze, and M. Mühlhäuser. 3d-auth: Two-factor authentication with personalized 3d-printed items. In Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems, pages 1–12, 2020.

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