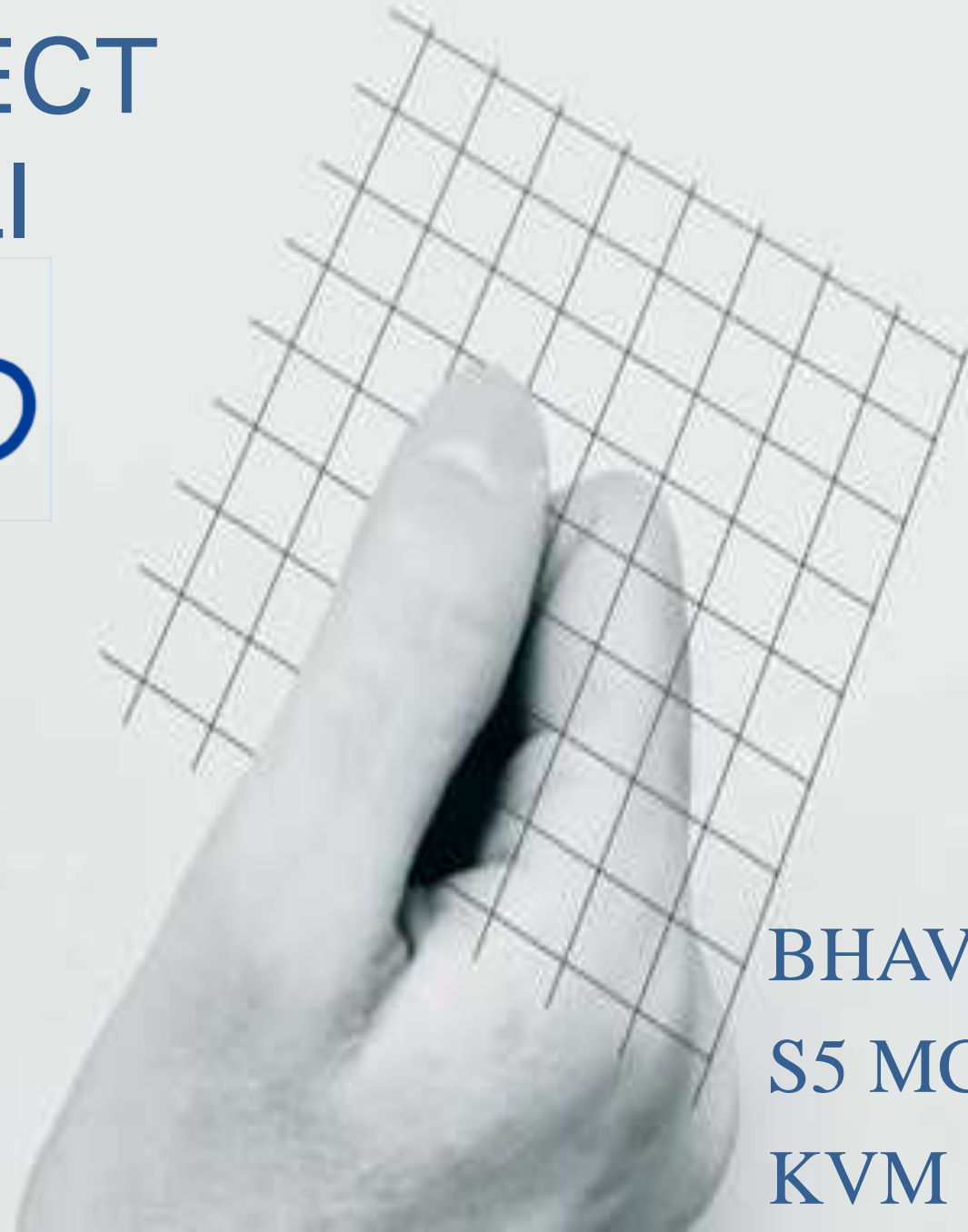


PROJECT SOLI



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ABSTRACT

- Project Soli is a new technology that uses radar to enable new types of touch less interactions.
- The movements of gestures from a human can be captured using a radar sensor, and by detection of these gestures, some special task on a device can be done.

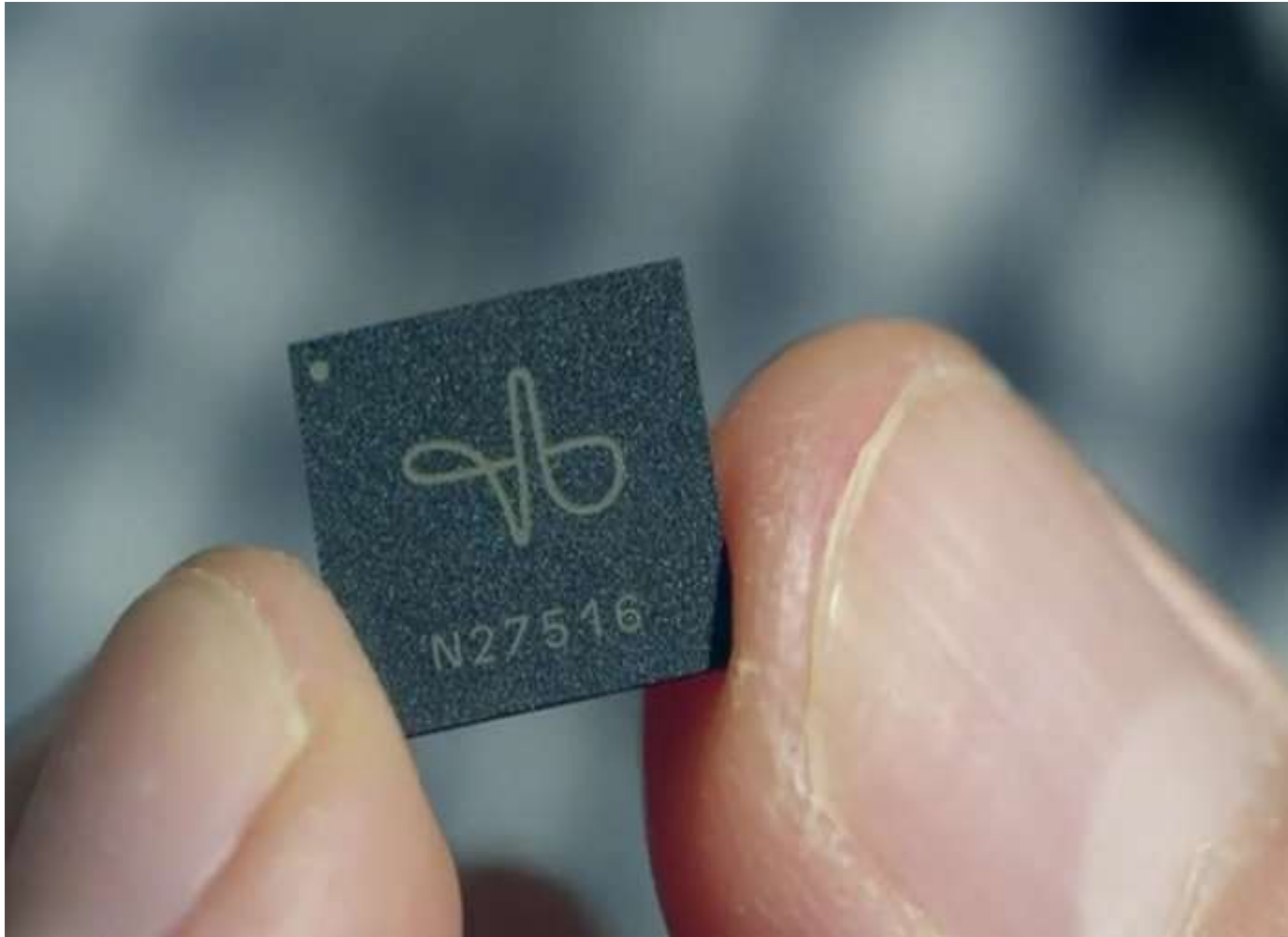


INTRODUCTION

- Project soli of Google ATAP(Advanced technology and project group)
- Our hands and fingers are the best way we have to interact with smart devices.
- One of the reasons is also the decreasing size of the screens.



Project soli chip



- Can easily be used in even the smallest wearable's that fits with in a tiny chip.
- It is capable of accurately detecting your hand movement in real-time.
- Its like motion and other gesture-tracking controllers.



- The soli is small in size of a 5×5 mm.
- It has a sensor which capture sub millimeters of motions of fingers in 3D space.
- It capture motions of fingers at a phenomenal rate of 10,000 frames per second

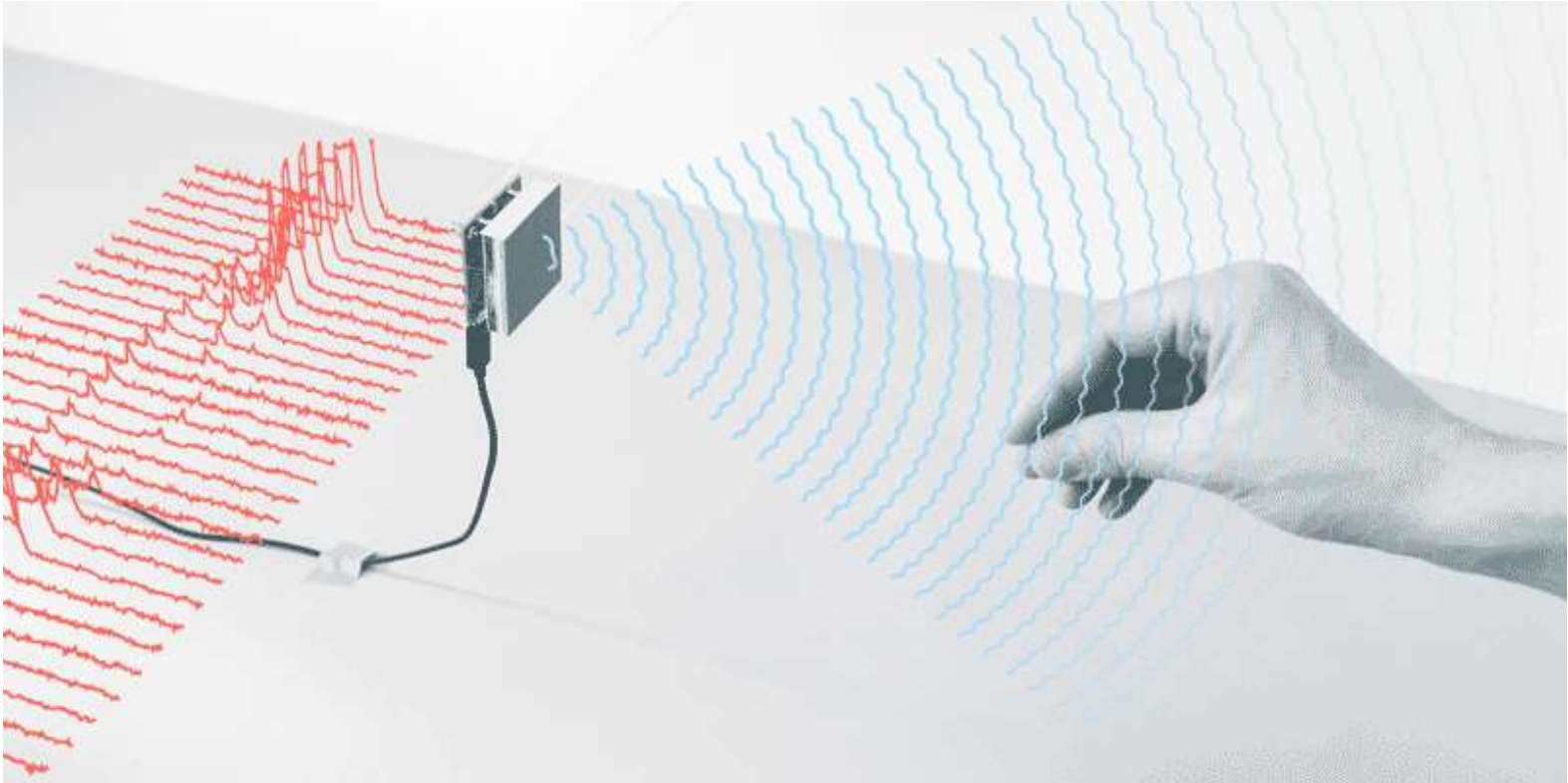


What a radar is ...?

- Radar is an object-detection system that uses radio waves to determine the range, angle, or velocity of objects.
- It is used by Army and Defense agencies to track movements of enemy.
- Sends radio waves towards the target and its receiver intercepts the motion.



Simulation of wave recognition



Types of Radars

- Google developed two modulation architectures:
 - a) Frequency Modulated Continuous Wave(FMCW) radar.
 - b) Direct Sequence Spread Spectrum(DSSS) radar.
- Both chips integrate the entire radar system into the package ,that enable gesture recognition



Features of Radar

- ✓ Insensitive to the light
- ✓ Can transmit over plastic materials like polycarbonate
- ✓ 3D gesture recognition possible
- ✓ Recognition of overlapping fingers



Working

- Soli sensor technology works by emitting electromagnetic waves in a broad beam.
- object with in the beam scatter this energy, reflecting some portion back towards the radar.
- Properties of the reflected signal, such as energy, time delay and frequency shift capture rich information about the objects.



- Such as its characteristics and shape , size , material , distance and velocity.etc.
- It then uses machines-learning to translate these movement to pre-programmed commands.
- Doppler effect to detect speed
- Virtual tools are used as a key to identify gestures.

What is machine learning..?

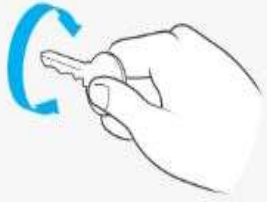
- Machine learning is subfield of computer science that evolved from the study of pattern recognition and computational learning theory in artificial intelligence



What is Doppler effect?

- It is named after the Austrian physicist Christian Doppler, who proposed it in 1842 in Prague.
- The **Doppler effect** is the change in frequency of a wave (or other periodic event) for an observer moving relative to its source.





Virtual Tools

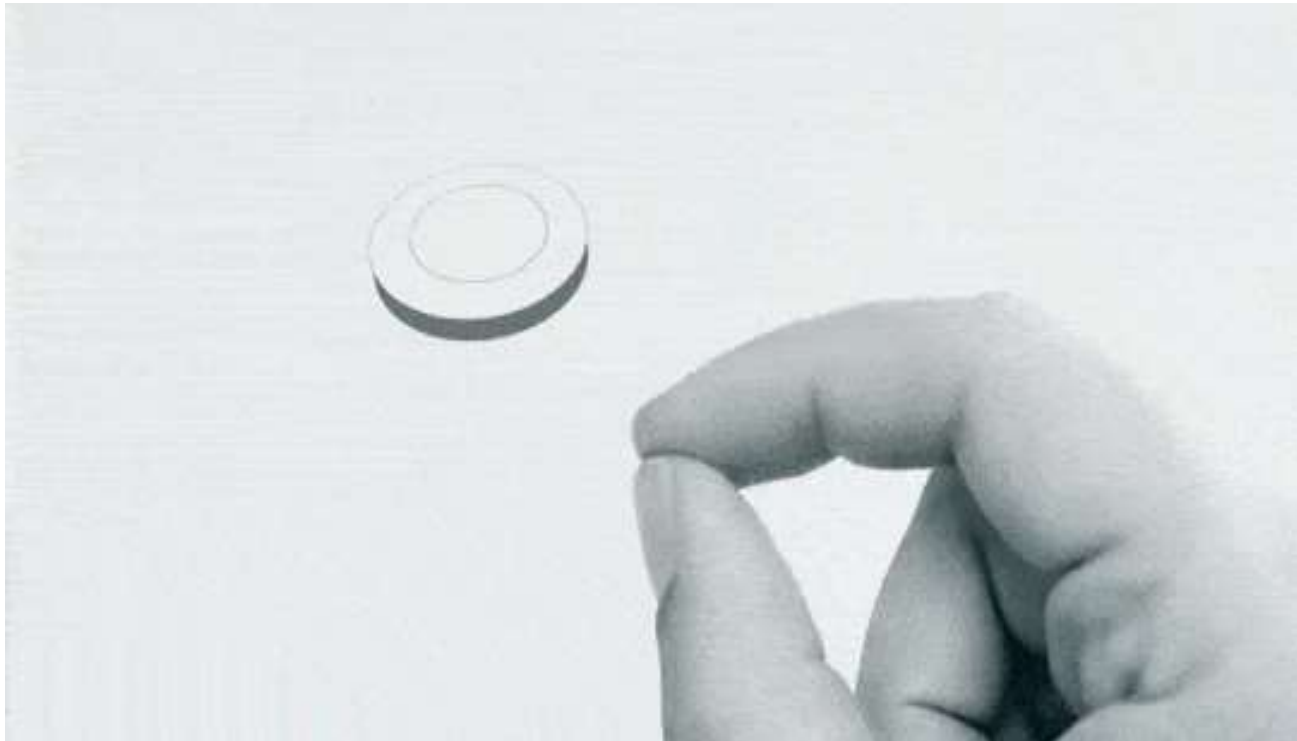
- The concept of virtual tool is key to soli interactions
- Virtual tools are gestures that familiar interactions with physical tools.
- This make it easy to communicate, learn and remember soli interactions.



Virtual tool Gestures

Eg.(1)

Imagine an invisible button between your thumb and index finger- you can press it by tapping your finger together



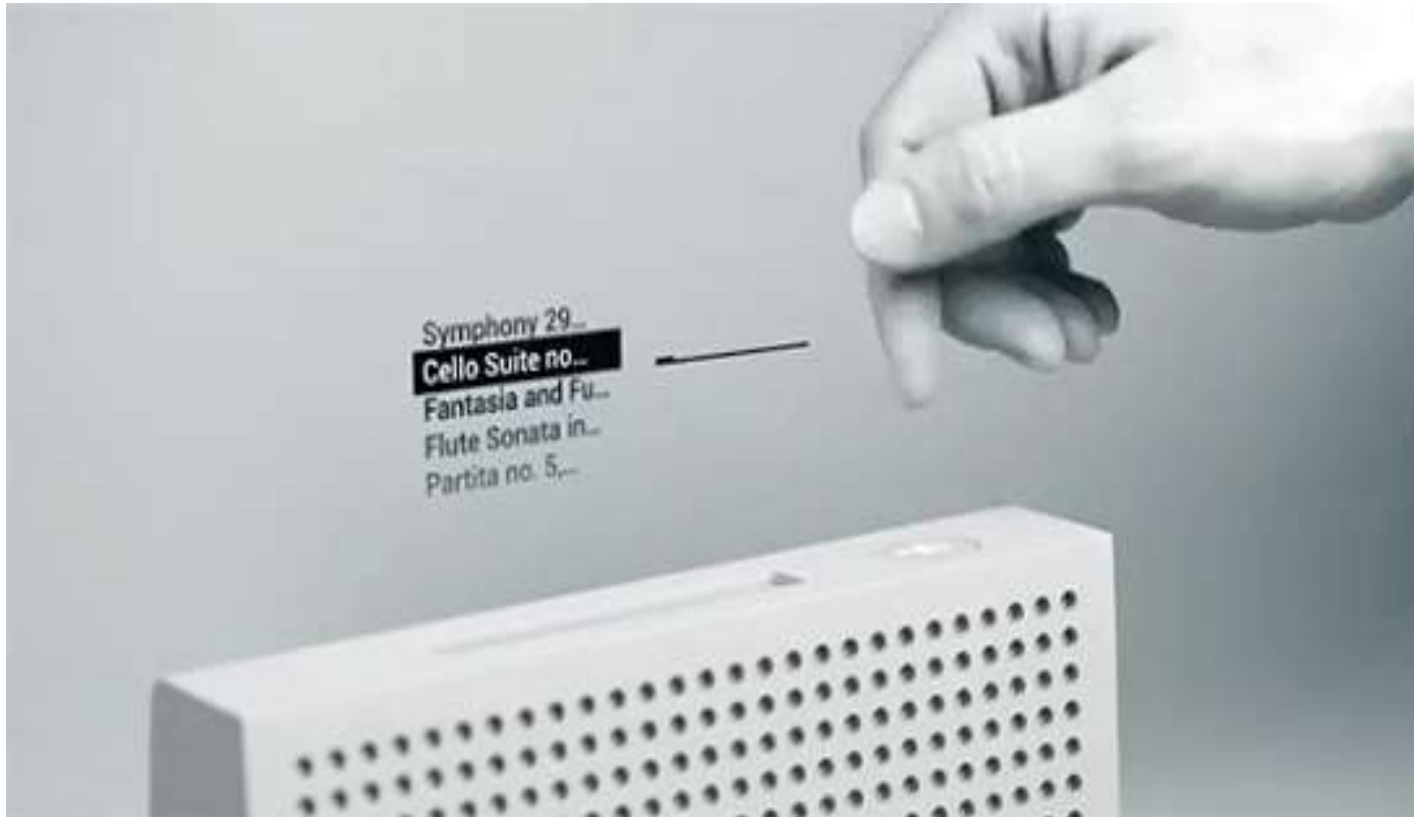
Using Google-Map by Gestures

Eg.(2)

If you turn by rubbing thumb against index finger



Controlling device functionalities using Gestures



APPLICATIONS

- In medical field.



- For playing games



- Smartphones can be controlled by using Gestures.



- In smart watches.



- Gadgets



ADVANTAGES

- Replace all kinds of buttons and switches and make the devices operable remotely
- Most of the existing motion sensor technique uses camera based motion sensing
- Allows to control Gadgets with gestures.
- Allows free hand typing.
- Good Accuracy over control .
- Need not to carry gadgets while using them.



DISADVANTAGES

- It has a limited radar range.
- Multiple gestures could not be possible at a time.
- Highly Expensive.
- Security Threat.



CONCLUSION

- One of the big problems with wearable devices right now is inputs, there's no simple way to control these devices.
- Therefore gestures will be used by individuals to carry out certain functions with electronic machines such as Smartphone's and desktops.



THANK YOU

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