

Xie Shiyun(190014191), He Jiayi(190013301),  
Fan Yehan(190014940), Qiu Mengqi(190013699), Chen Ruizhuo(190014010)

## I Introduction



In a new period of development of intelligent agriculture, we suggest our company to innovate in the agricultural area and develop a solar car for pests control based on AI technology.

We will introduce our new product from the following aspects:

- Background
- Materials and methods
- Final product and usage flow
- Conclusion

## II Background

We sent out 486 questionnaires, got the following requirements and calculated the importance percentage.

According to the results of the questionnaire and related papers, we find the innovation and breakthrough point of product development.

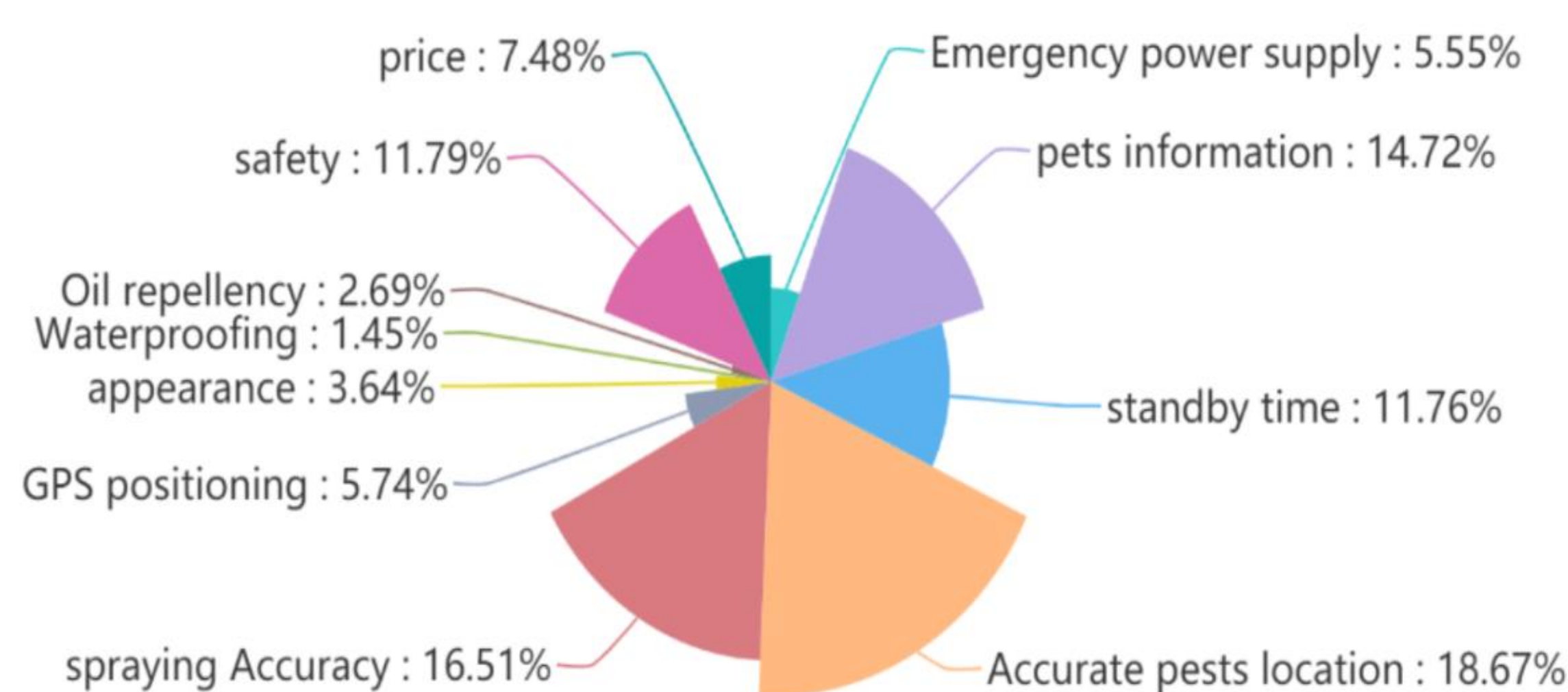
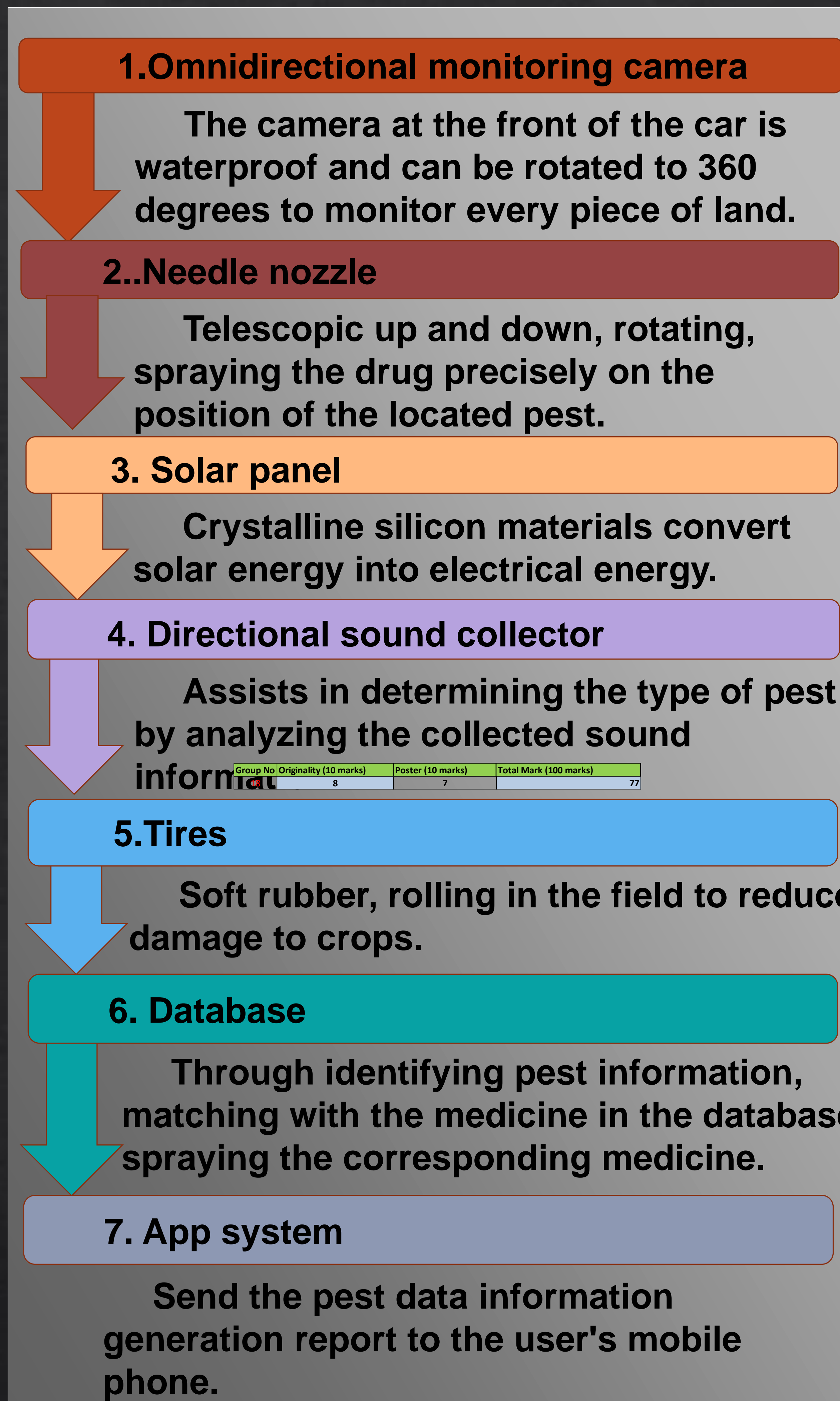


Figure 1. The importance percentage

## III Materials and methods



## IV Final product and usage flow

Farmland solar car obtains the image through the omnidirectional monitoring camera, converts the image into a digital signal through data processing, and determines the type and location of the pests with the aid of directional sound collector, and then it matches the corresponding pesticide through the database.

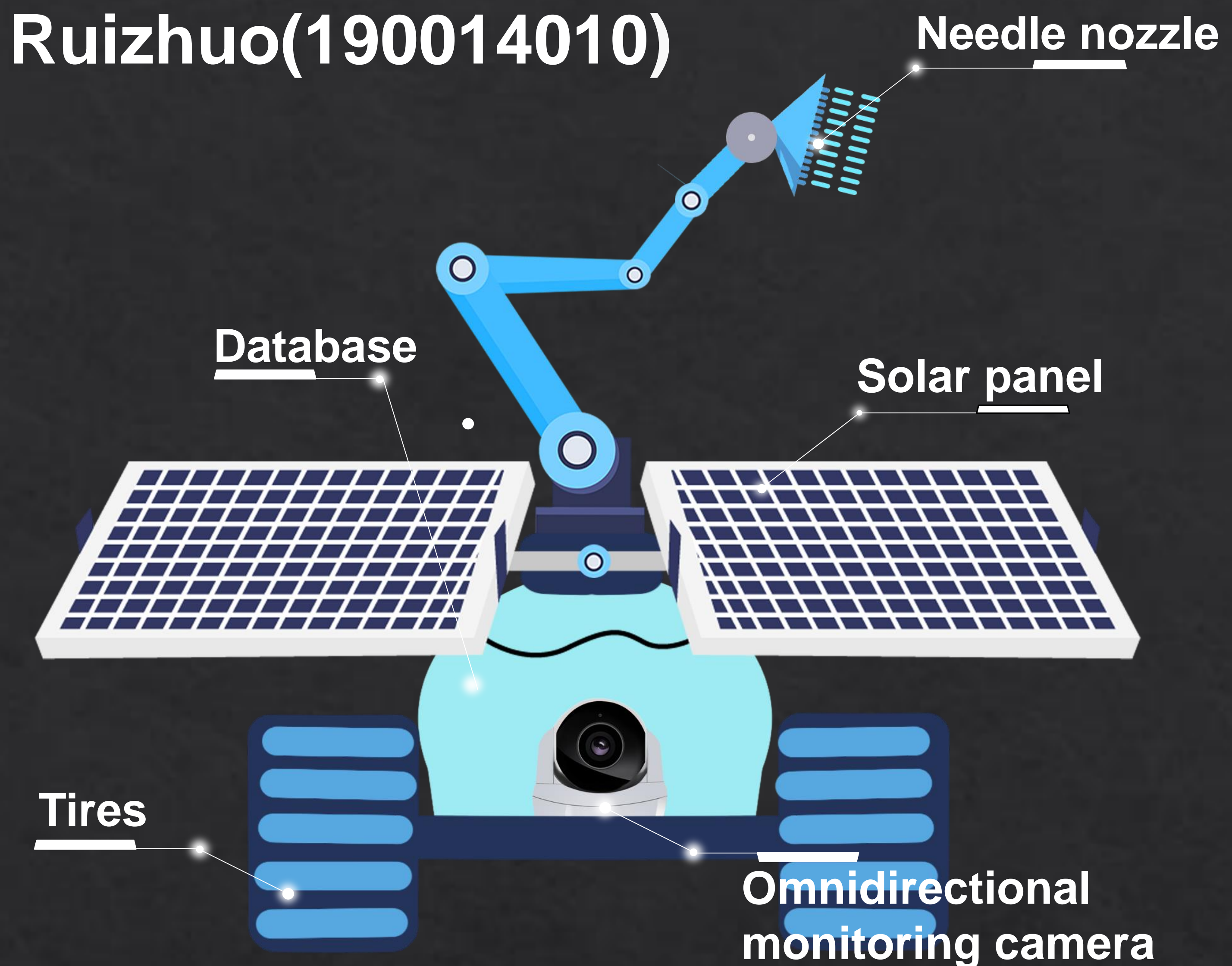


Figure 5. Farmland Solar Car

The GPS system of the farmland solar car plans the route intelligently and moves automatically to the position of the pests, through the 360 degree rotating needle nozzle, it can accurately sprays the pesticide to kill the pest.

Finally, the farmland solar car will generate a report of the collected information and predict the growth trend of pests, and send it to the user's APP to remind the user to load the corresponding pesticide.

The farmland solar car can work all the time without charging, which converts light energy into electricity through solar panels during the day.

## V Conclusion

We tested our concept through various survey and learnt that there's a large market of our product and finally decided to develop a solar powered car. Our product is Innovative and practical, and they have the potential to be put into production

### References

Niki Dufty, Peter Martin and Shiji Zhao, Demand for farm workers: ABARES farm surveys 2018,2018.



# AI-based At-Home Fitness Trainer - Smart Fitness Mirror



Group 052

Zefang Wei (19001766), Yuxin Xiao (190017631), Xinzhu Zhao (190017239),  
Kexin Yang (190016564), Yichi Gao (190017332)



## Product Concept

Smart Fitness Mirror is an AI fitness coaching mirror which can meet the increasing "Workout at Home" need through body-posture recognition tech and AI analysis. It can intelligently identify user's movement and give feedback relying on its self-learning database, so as to help them workout at home scientifically and effectively.

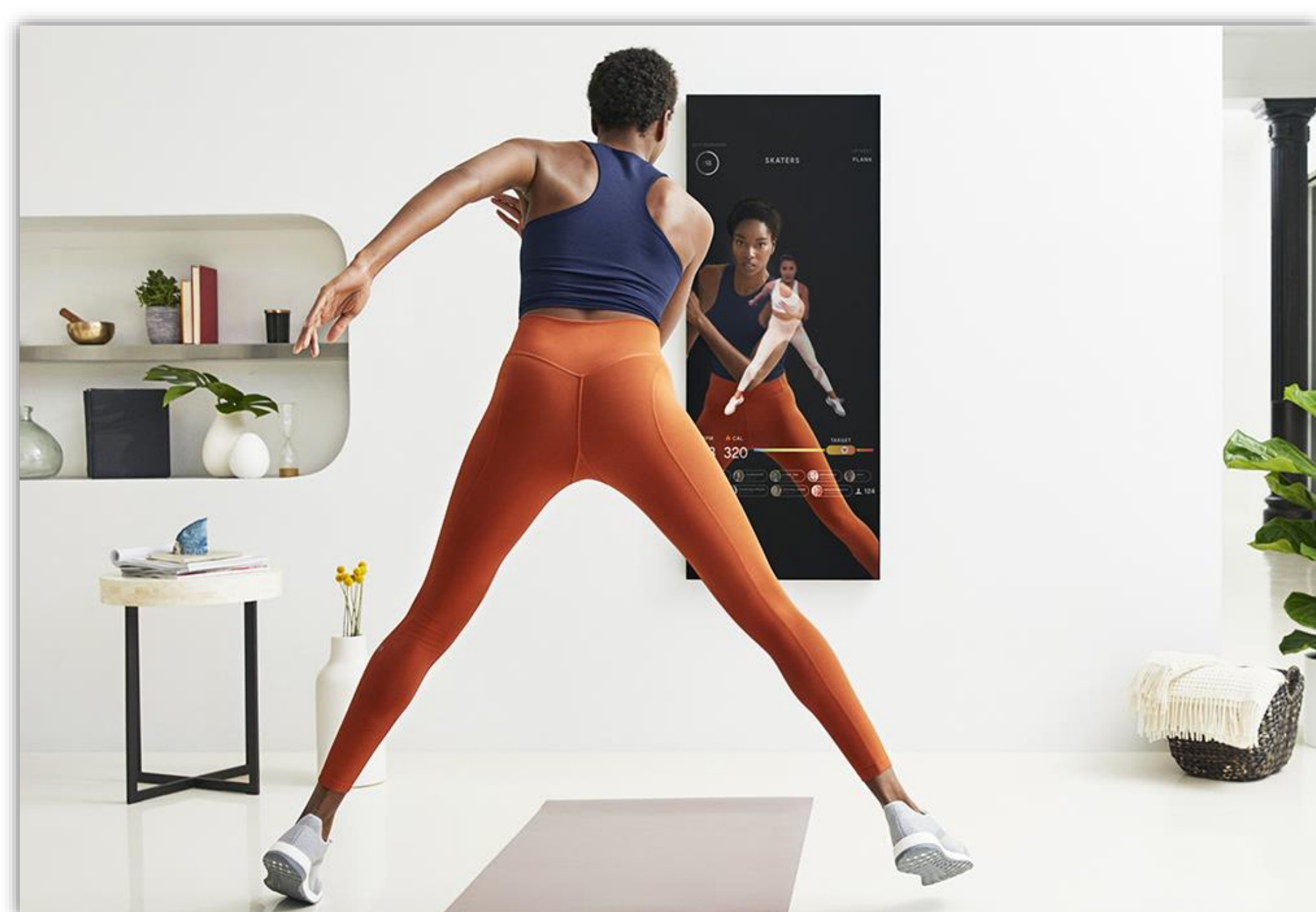


Figure 1. Concept picture

## Customer Needs

With the quarantine all over the country, over 50% user prefer to workout at home with assistance. In this way, our target customers are the people who want fitness at home only, with the AI utilities, to adjust, guide them to achieve their goals.

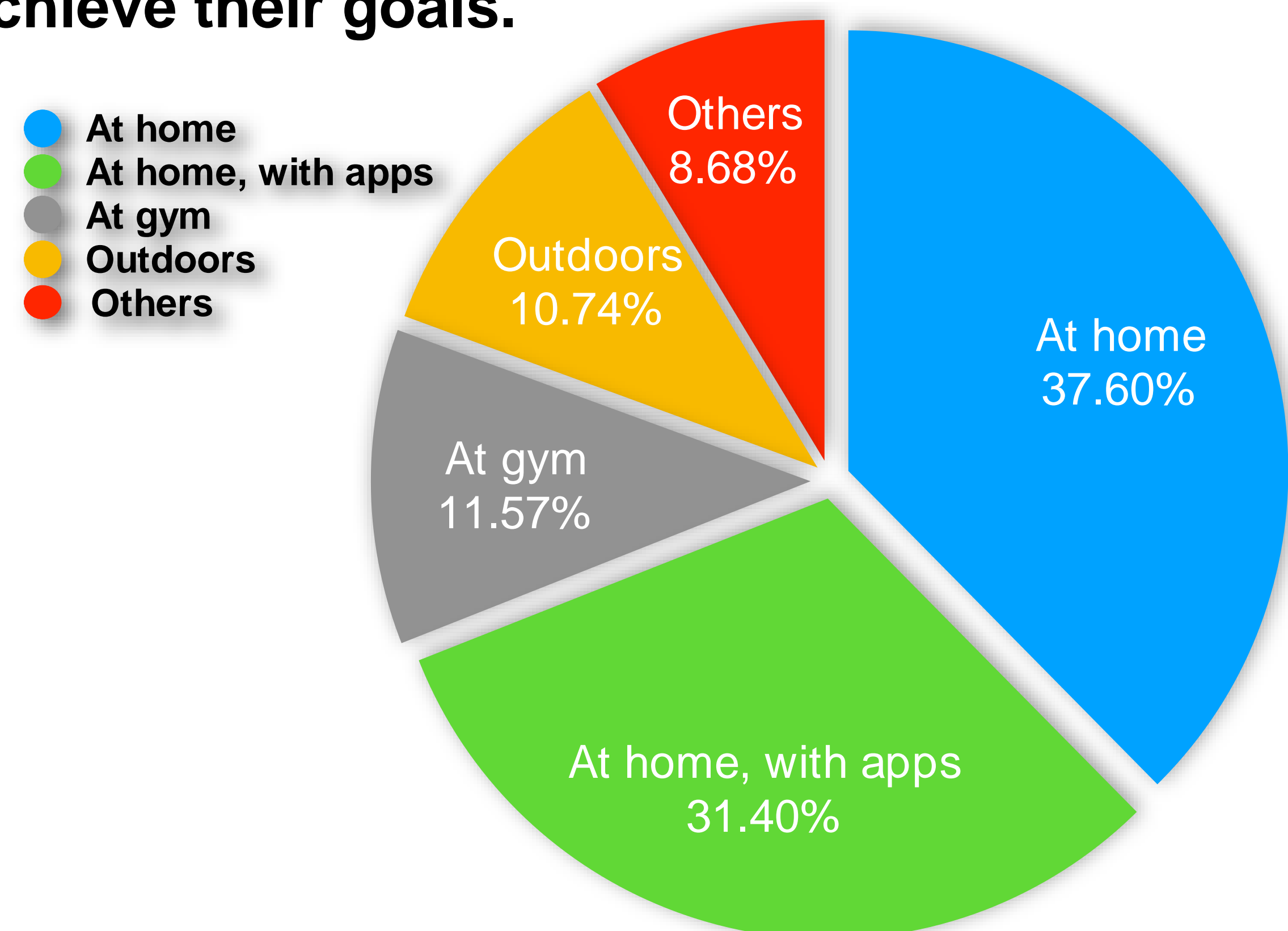


Figure 2. Fitness method preference survey



Figure 3. OpenPose technique

## Motion Capture Technology

In posture monitoring section, we adopt the first real-time multi-person 2D attitude estimation application based on deep learning called OpenPose which can identify users' motion. We hope to use our constantly updated database to analyze these data and give users feedback and guidance in next steps.

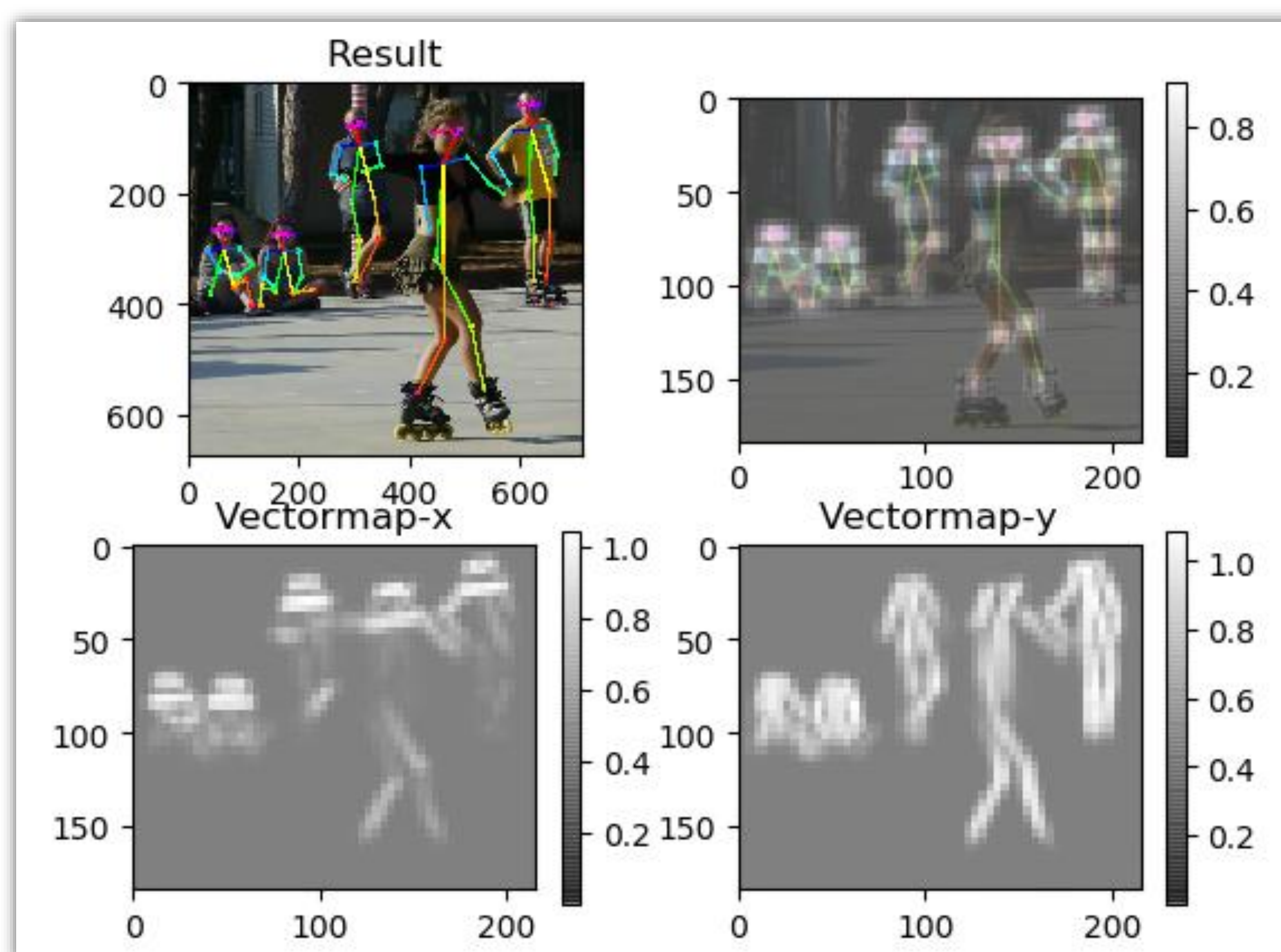


Figure 4. Facial Recognition

## AI Analysis

In intelligent suggesting and planning part, we adopt AI image recognition tech and knowledge base to analyze users' behavior. After reaching an agreement with the user, every posture analysis can be used as information to enrich the knowledge base. Professional trainers will be invited to provide correct demonstrations as well.

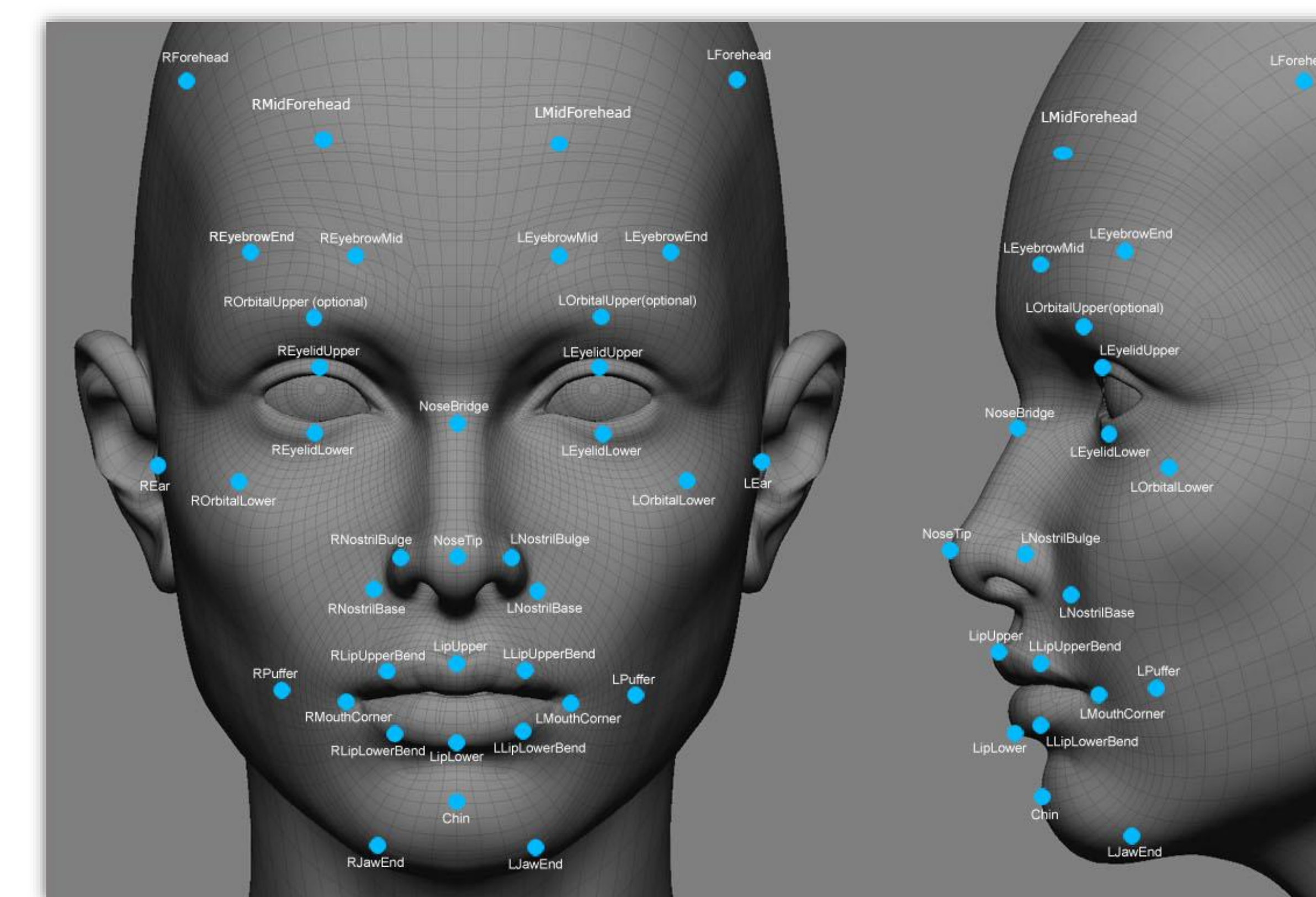


Figure 5. Facial Recognition

## Product Effect

By the use of Smart Fitness Mirror, users can workout on their own without leaving home, while ensuring the safety, scientific and effectiveness of training. It allows users to get rid of going to the gym regularly, and in the long run, users can gain the same as hiring long-term personal trainer through this one-time consumption.

## Acknowledgments

The poster was possible because of Nickos Paltalidis, James O'Connor, Michaela MacDonald, who gave us lectures and guidance.

## References

- [1] Engadget. 2020. How Biometrics is Silently Becoming the New Normal [Infographic] | Engadget. [ONLINE] Available at: <https://www.engadget.com/2017-01-10-how-biometrics-is-silently-becoming-the-new-normal-infographic.html>. [Accessed 24 April 2020].
- [2] Wu Hao, Hu Bo. Bluetooth technology in communication [J]. Charming China, 2018, (33): 242.



## Product Concept

AI nursing dog is a robotic nursing assistant, designed to provide help to elderly, monitor their health and resolve the loneliness of the elderly with advance technology such as AI and 5G.



Figure 1. Concept of AI nursing dog

## Application scenario

- Wherever elderly need help: old people is not easy to move.
- Wherever elderly need care: old people often suffer from diseases.
- Wherever elderly need companion: old people often live alone.



Figure 2. Dogs can be good friends with old people

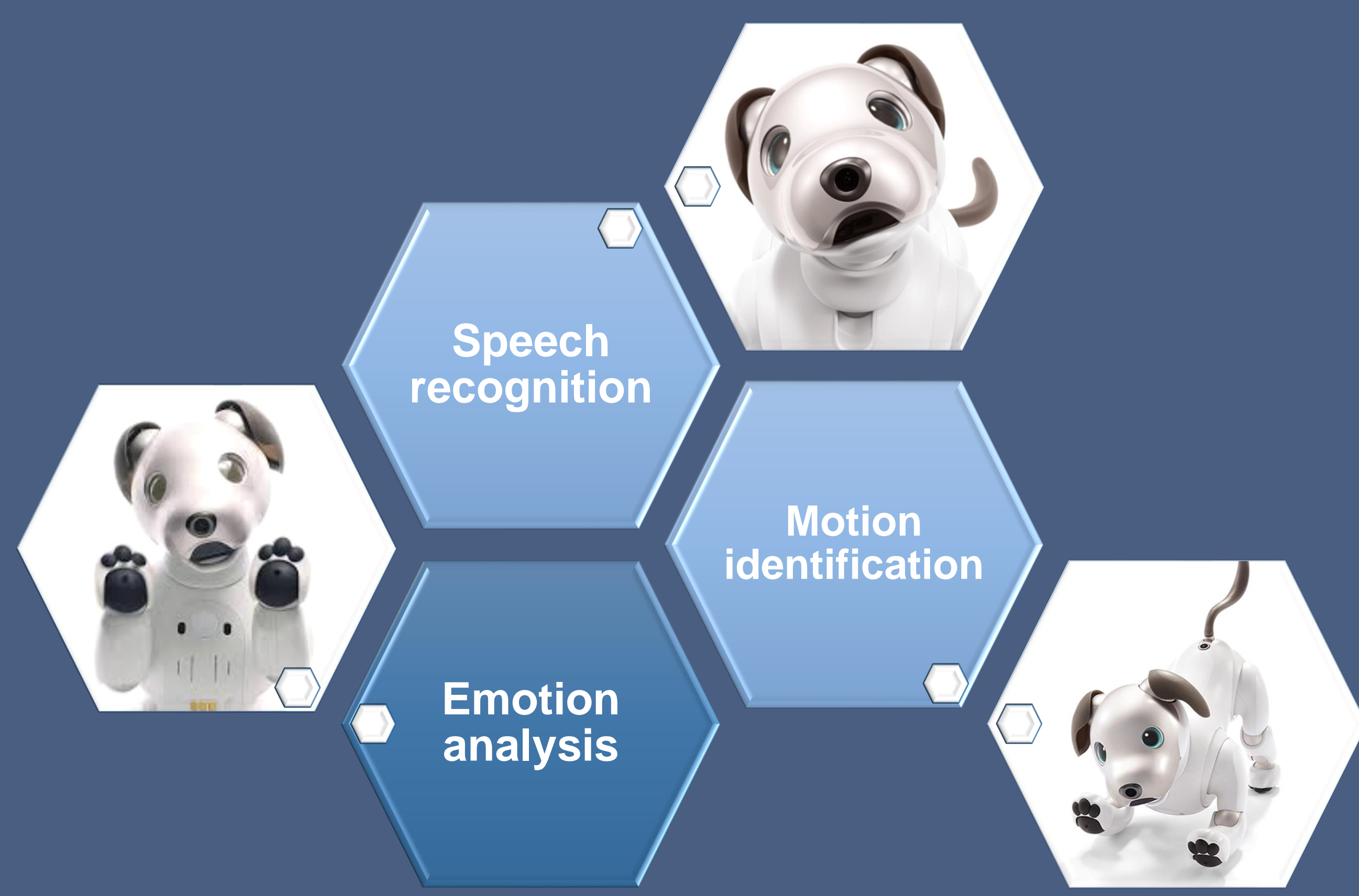


Figure 3. AI technology embedded in the product

## Target customer

- Old people living alone who need medical help
- People for all ages who need long-term medication and medical monitoring
- People who are unable to accompany their parents all the time because of work or other factors

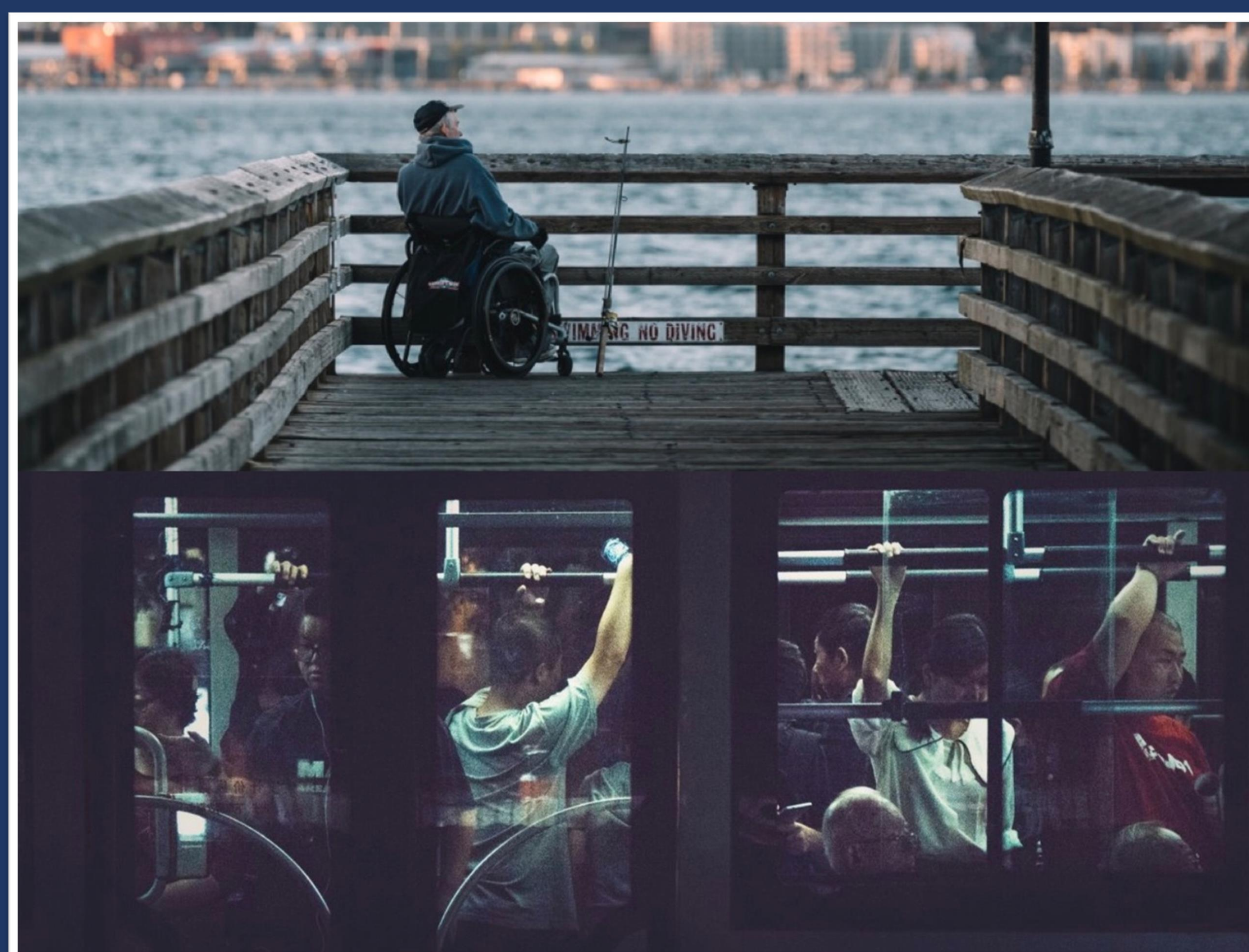


Figure 4. Lonely old people and busy young people

## Competitive advantages

- Integrated advanced AI technology including voice speech recognition, motion identification and emotion analysis<sup>1</sup>
- Capable of 24/7 internet connection of Wi-Fi or 5G with a long battery life. It can even make a satellite call when its master is in danger<sup>2</sup>
- Good after-sales service and intimate product consultation to users through a series of channels



Figure 5. Combination of AI and 5G

## Product feature

- Monitor the health condition
- Intelligent communication function e.g. chatting, alarming
- Entertainment function

## Reference

1. Assistive social robots in elderly care, Joost Broekens
2. Chen, J., 2017. JP2017010516A - Method, Apparatus, And Terminal Device For Human-Computer Interaction Based On Artificial Intelligence - Google Patents.



# AI piggery – First Step Towards the Future of Livestock Farming

Group 63

Runyang You(190014032) Bohan Cui(190012500) Jinghan Wu(190013356)  
Linya Cheng(190013611) Wenru Weng(190014537)



## BACKGROUND

Technology adoption has long been considered as a key driver for increasing farm productivity(Manda et al., 2016), for it not only increase household incomes, enhance rural livelihoods for both livestock and farmer, but it can also help achieving sustainability objectives, thus reducing requirements for natural resources and labor force(Smith, 1998; Mendiola, 2008).

Hog farming is currently the major livestock farming of China that has an annual output of 42,550,000 ton (National Bureau of Statistics, 2020)

With the increasing demand for food, along with the higher standard for these products(Hunter et al., 2017), husbandry is considered as a promising industry.

2019 Industrial Structure of China's Husbandry

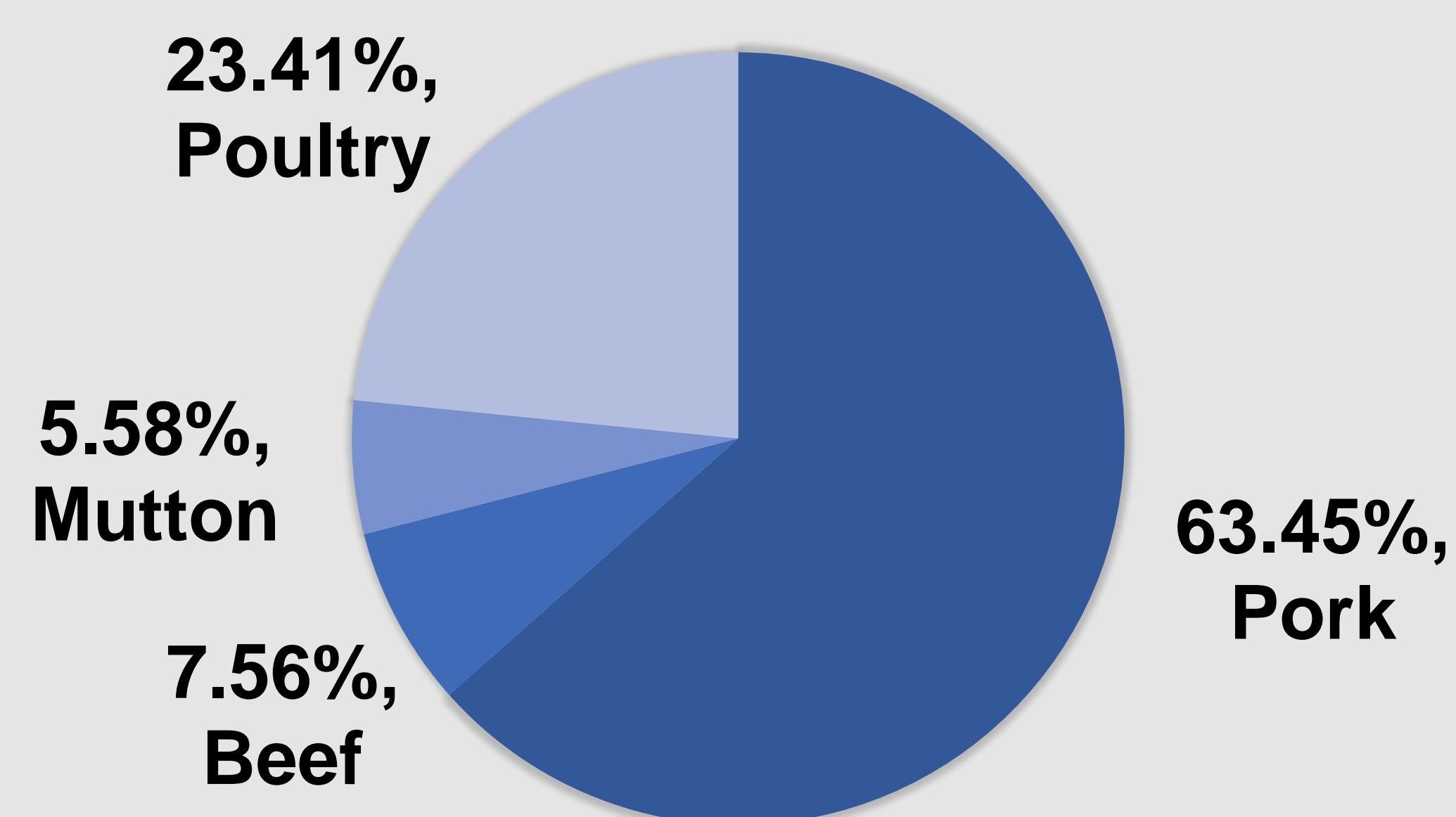


Figure 1. From National Bureau of Statistics

## PRODUCT INFORMATION

### Product Description

An intelligent piggery that can provide per-cow information and give suggestions on feeding and other processes of hog farming according to analysis on physiological data from the pre-hog database.

## PRODUCT INFORMATION

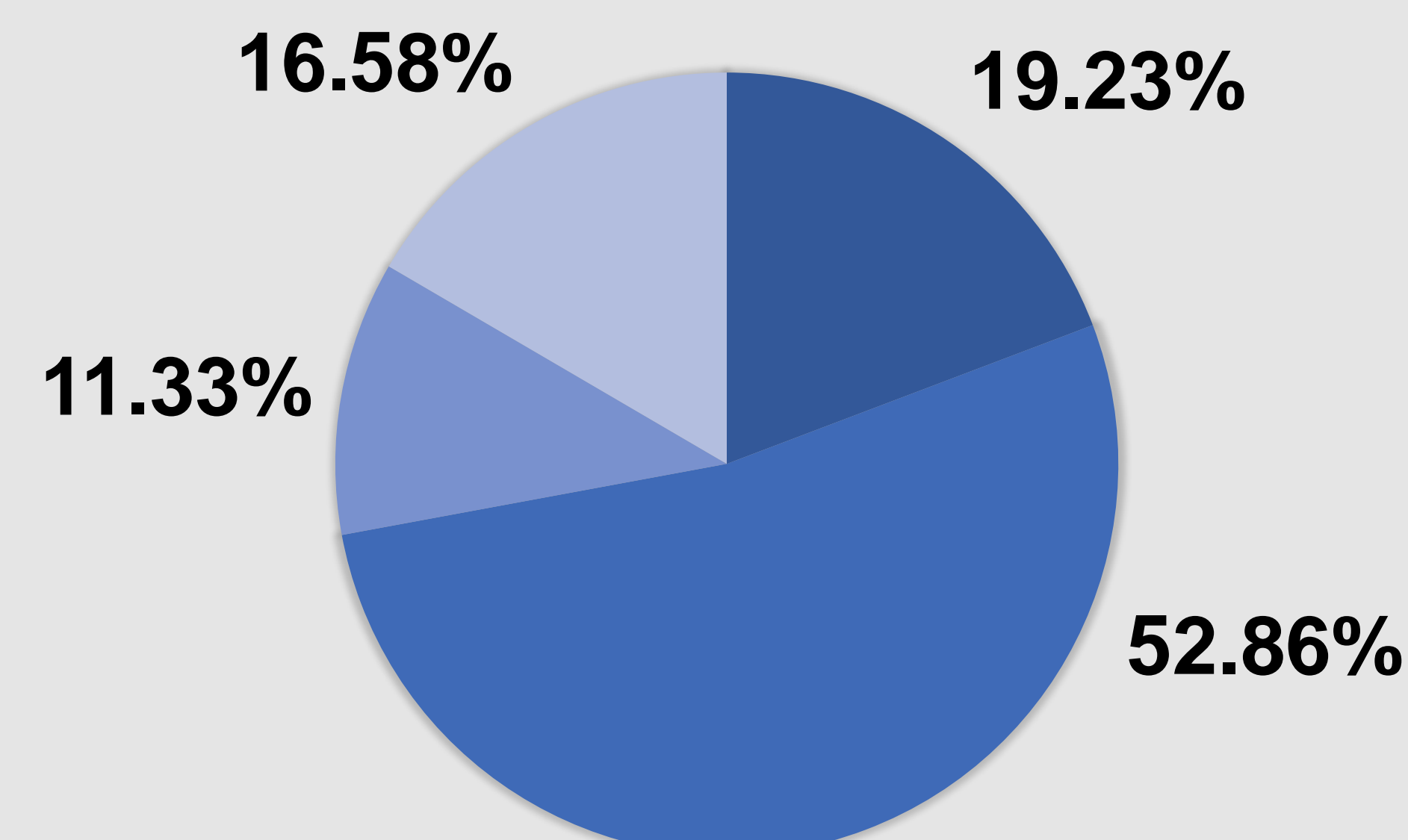
### FEATURES

- Record pre-hog data and create database of live pigs
- Analyse and give suggestions according to the data
- Automatic temperature and humidity control
- Automatic feeding control



## SURVEY RESULTS

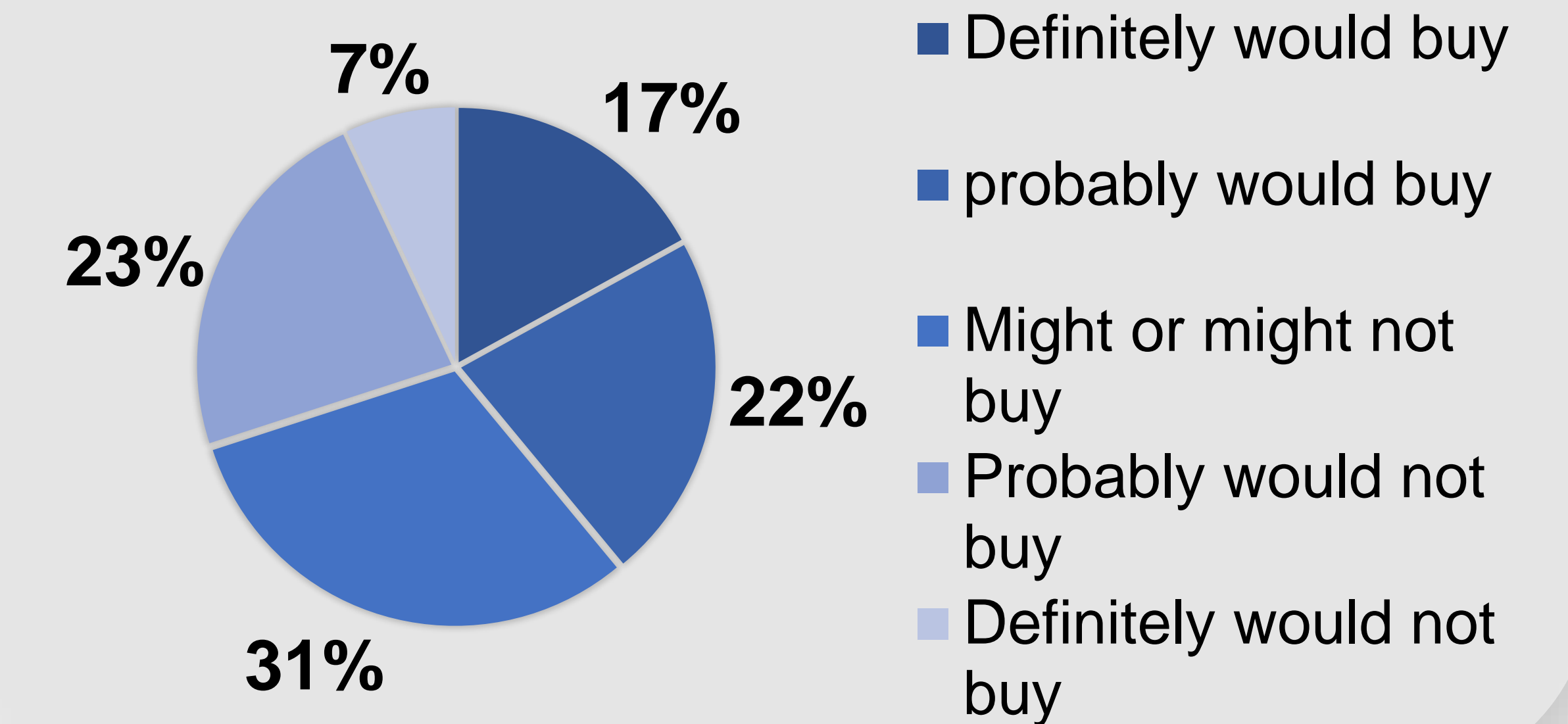
Customers' preference towards feature combinations:



- Scheduled Feeding & Automatic Adjustment
- Adjustable Feeding & Automatic Adjustment
- Scheduled Feeding & Smartphone-controlled
- Adjustable Feeding & Smartphone-controlled

## SURVEY RESULTS

Customers' willingness to buy the products:



## CONCLUSIONS

- In the light of our previous research, the demand for our products would be approximately 19 million farms.
- The demand for pork in the market remains at a high level, despite its raising price. Therefore, high tech business model is needed to meet the demand.
- Small-scale family piggeries are unwilling to buy our product. As a result, our primary customers are large-scale piggery owners.

## References

Smith, R. C. (1998) 'Transnational localities: Community, technology and the politics of membership within the context of Mexico and U.S. migration', *Transnationalism from Below*, pp. 196–238.

Mendiola, M. (2008) 'Migration and technological change in rural households: Complements or substitutes?', *Journal of Development Economics*, 85(1), pp. 150–175. DOI:

<https://doi.org/10.1016/j.jdeveco.2006.07.003>

National Bureau of Statistics (2020) 'National Economic and Social Development Statistics for 2018', (2020). Available at:

[http://www.stats.gov.cn/tjsj/zxfb/201902/t20190228\\_1651265.html](http://www.stats.gov.cn/tjsj/zxfb/201902/t20190228_1651265.html)



# Tiri ----- AI Elderly Nursing Robot

Group 64

Xiangrong Xing, Linfei Huang, Shuyun Li, Lu Fan, Xintong Li



Figure 1. Tiri is accompanying the elderly

## Competitive Advantages:

- With the apparent and inevitable aging structure of the whole population, smart elderly nursing industry is going to thrive.
- The government is now attaching more and more importance on elderly caring.
- With the developing technology, people are able to improve their living quality after retirement.
- The aged groups with no child are more likely to suffer from disabilities.
- Continuous real-person nursing will cost much, people are more willing to spend on a long-term product.



Figure 2. Tiri is going to examine the elderly

## Target Consumers:

- Susceptible and vulnerable aged groups
- The elderly have no child or with no child around
- The elderly with physical or mental problems
- Nursing homes or hospitals that tend to cut down spending on labor
- The youngsters who care much about self health conditions



Figure 3. Design concepts of Tiri

## Product Expectancy:

- Move and act with fluency and flexibility
- Reasonable size and outlook that seems like a real human
- Efficient daily health checks with accurate outcomes
- Keep up with latest nursing techniques
- Avoid redundant algorithms and analysis



Figure 4. The main technology of the Tiri

## Product Features:

- Combining AI, Big Data Analysis and System Integration technology
- Meticulous nursing with appropriate techniques
- Real-time feedback on health condition
- Automatically contacting family doctor and making reservations
- Medicine reminder in case of memory problem
- Performing simple daily health checks



Figure 5. Elderly people in need of care

## References

Minjie Feng,(2003), Enterprise new product concept evaluation system



## Background:

In a paper by Hanhua Long(2018), in recent years, AI technology has developed rapidly, and its comprehensive application has become an unstoppable trend. In 2019, most adults exercise regularly, according to the 2019 sports trend report of Mintel(2019), a market research consulting company recently released. Nearly two-thirds exercise many times a week, and one-fifth exercise every day. Our group combines AI with sports to develop a product to help users keep fit.

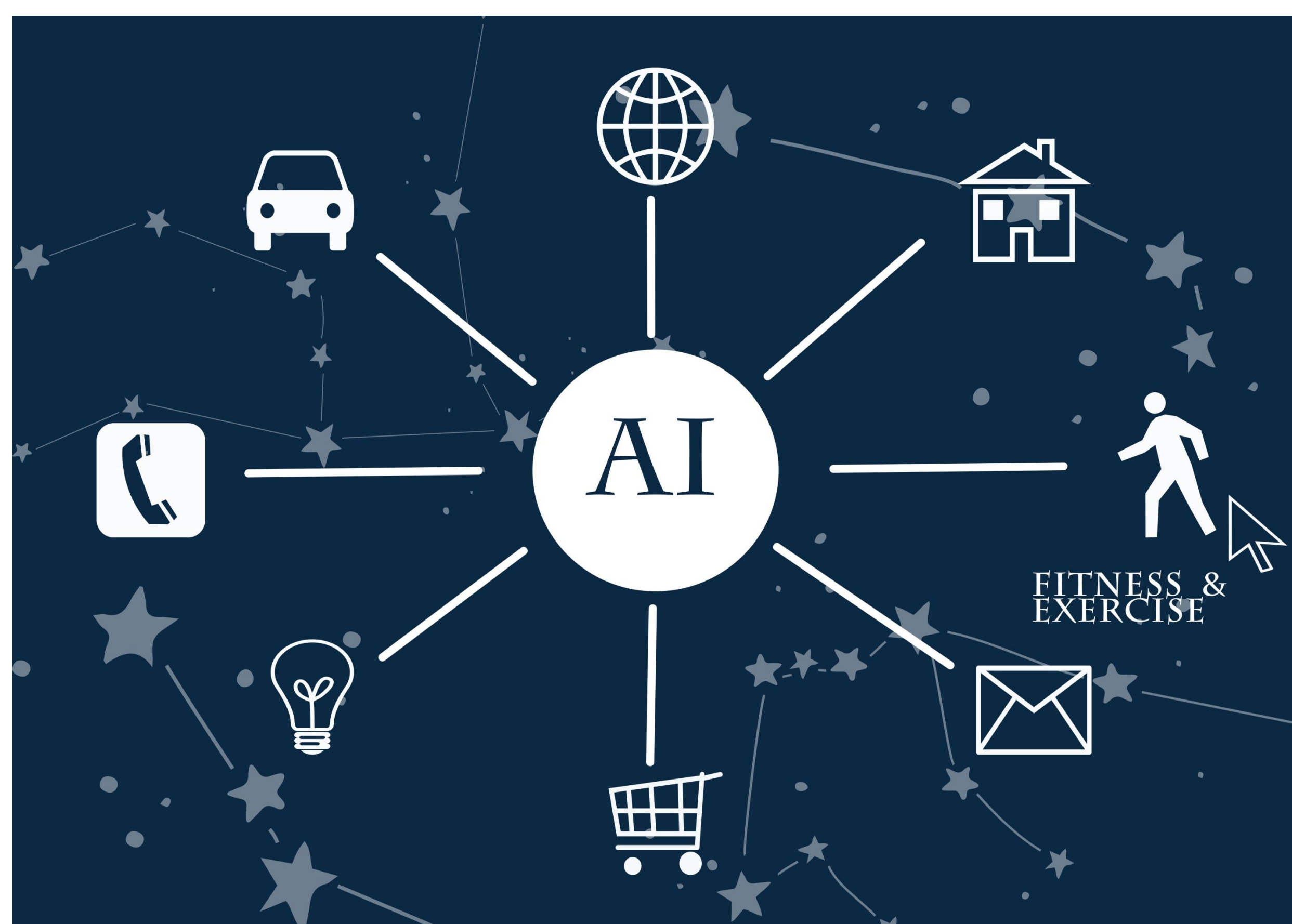


Figure 1. The Background

## Product Functions:

### Hardware:

Depth 3D camera with bone monitoring technology can capture, detect and correct user's actions in real time.

### Software:

1. It provides a large quantity number of exercise classes.
2. Athletic people invited to the platform will share their experience
3. It has a multiplayer game model.
4. Users can purchase the products they need in the e-commerce platform link in the software.



Figure 2. Schematic diagram of hardware equipment

## Competitive Advantages:

1. This AI bone monitoring technology is an emerging technology with technical barriers and a few existing competitors.
2. The product has the characteristics of small and portable, user-friendly, no time and place restrictions.
3. The product has a single-player and multiplayer interactive entertainment mode, which increases the fun of sports.
4. Products can provide customized services to meet the needs of people with special needs.

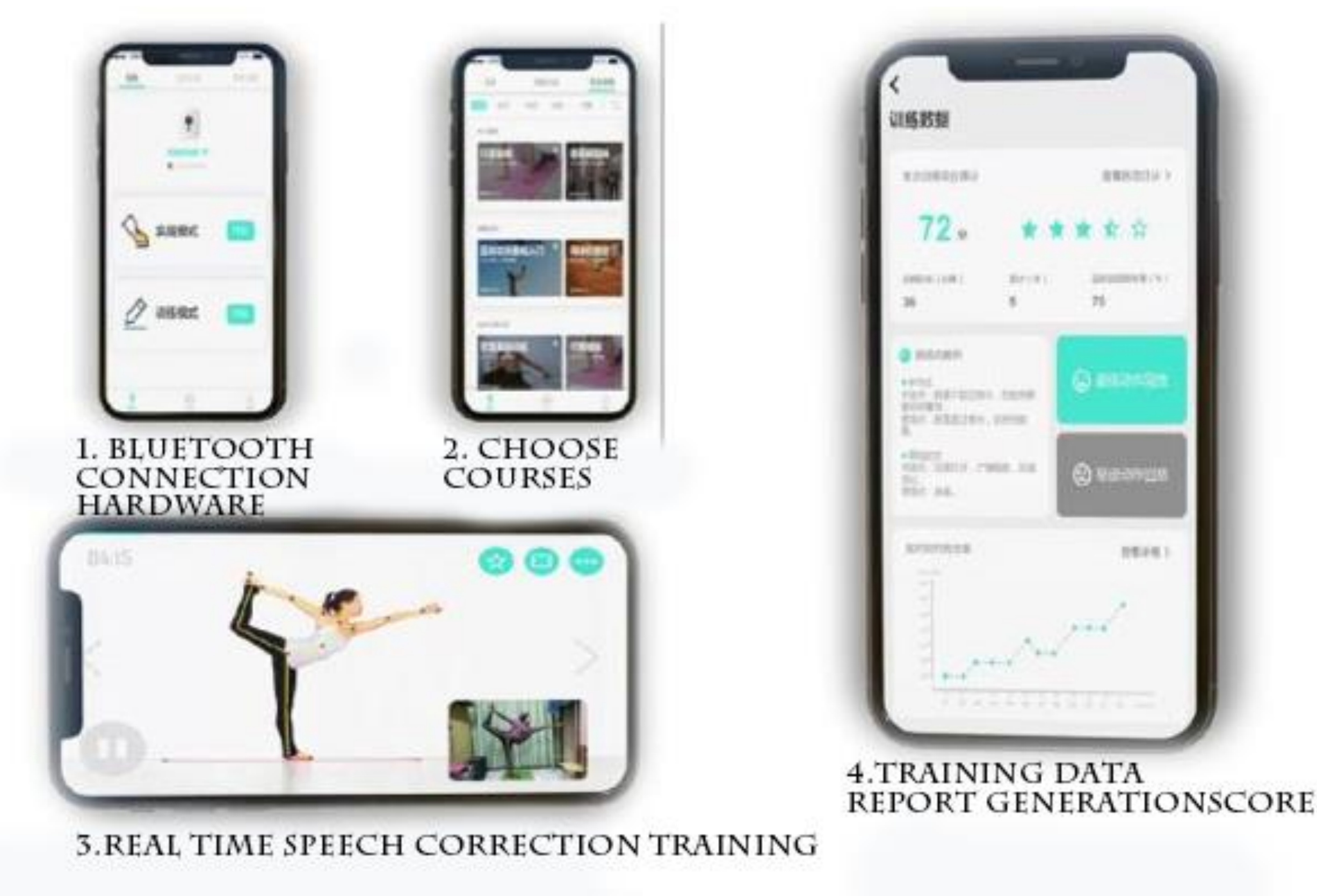


Figure 3. Schematic diagram of software interface

## Customers needs:

1. The user hopes that the final product is light and easy to carry, without excessive use restrictions.
2. The user hopes that his privacy can be protected and pay attention to the permissions of the product.
3. The user requires the detection technology to be accurate and able to get real-time feedback.
4. Users hope to get good after-sales and upgrade services, and consumer rights are guaranteed.
5. The user hopes that the software can make personalized recommendations based on personal usage habits.
6. Users hope that there will not be too many advertisements and useless information in the software.



Figure 4. Schematic diagram of bone monitoring technology

## References:

- [1] Long H.H.(2018) Application and development trend of artificial intelligence (AI) technology. Science and Technology Innovation Herald,No15.
- [2] 2019 sports trend report. Retrieved April 22, 2020, from <https://zhuanlan.zhihu.com/p/120828434>



# LWZ8 — a smart helmet based on AI in extreme sports



Group 68

Kezhou Zhang 2018212914 190016575 Zihan Li 2018212888 190017790

Yixin Li 2018212891 190017413 Yuting Wang 2018212910 190017583

Xinya Zhou 2018212915 190017181



## Image recognition Function

The helmet is equipped with one front camera and one camera at the back. These cameras have a 360 degree view of things happening around you at every minute. When it detects a falling rock or an approaching bear, it can realize the danger and give timely warnings. Besides it can offer you the name and brief introduction on request when it “sees” a rare plant. It has a high accuracy of image recognition. It can even “see” a tiny insect about 1 meters away from you!



Figure 1. Image recognition function

## First Aid Function

The product comes with two first aid measures. A voice-controlled automatic injection module is provided near the neck muscles. When the voice recognizes the injection instruction, it can automatically extend the needle for intramuscular injection of a certain amount of liquid medicine. A dark compartment for emergency medicine is protruded separately near the mouth. When the button is pressed with the tongue, the medicine will enter the mouth from the dark compartment

## Protective Function

1. **Sturdiness:** The helmet material is strong and light. While protecting users, it also lightens the load on them.

2. **Shock absorption:** The helmet’s interior has a isolation belt and a comfortable elastic buffer layer, which ensures that accidental impact will not cause any direct force on any part of the skull.

3. **Striking resistant:** When users are hit by falling objects, most impact force will be absorbed by the helmet’s components.

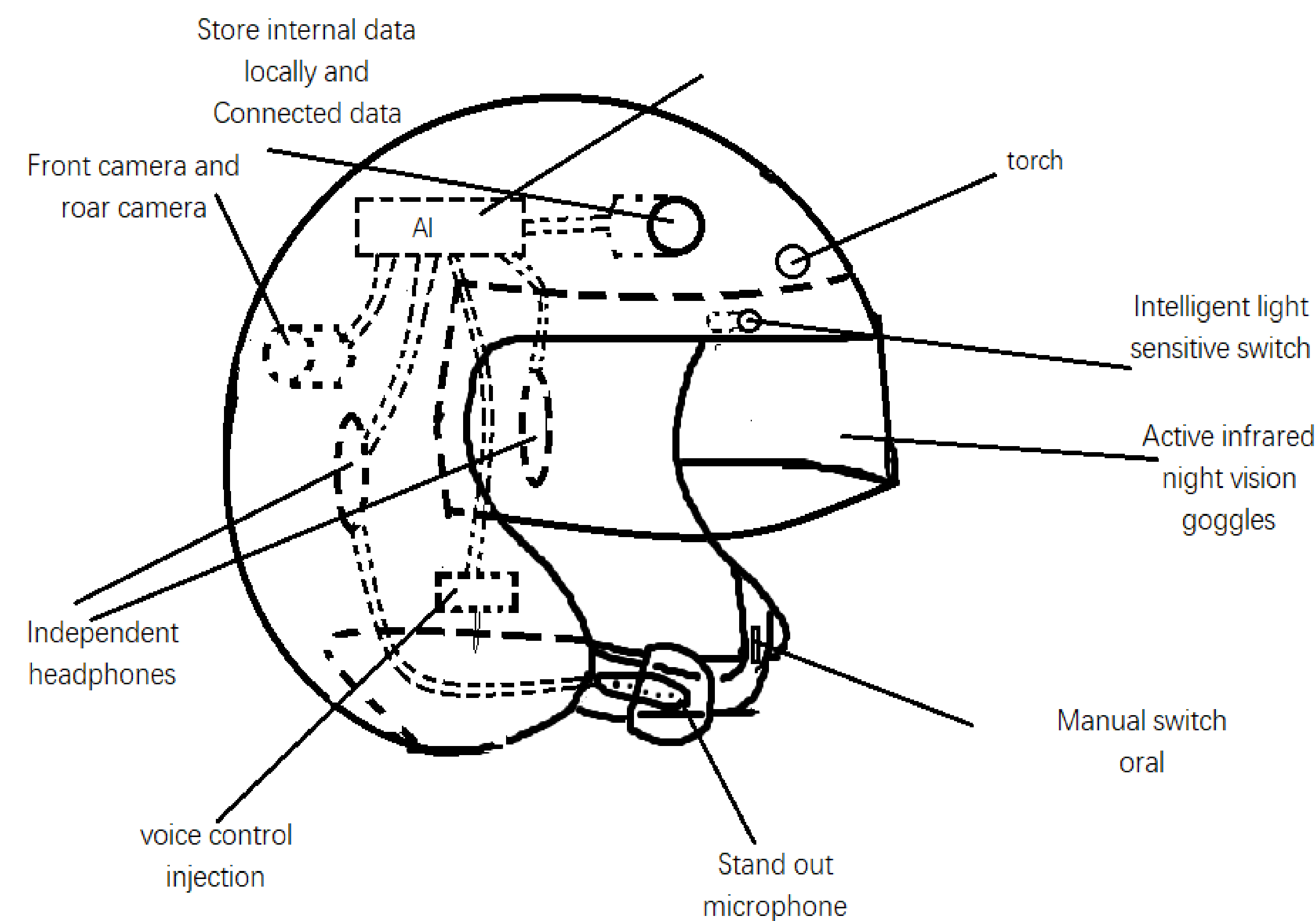


Figure 2. LWZ8 smart helmet  
Verbal description of our product

This helmet has two cameras at the front and back, which are used to identify the changes of the surrounding environment. It has AI intelligent danger warning and emergency response function. It can be used in the state of both with Internet connection and without Internet connection. It includes active infrared night vision goggles that can be pulled out. It also includes hidden drawer to contain medicine, voice controlled emergency syringe and flashlight..

## Night Vision function

The active infrared night vision instrument relies on

its own artificial

infrared light source to emit light to illuminate the target, and at the same time receives the infrared light reflected by the target, which is converted into a visible image.



Figure 3. Night Vision function

## Night Vision function(continued)

Active type infrared night vision instrument has its own light source, so it is not affected by the ambient lighting conditions. Since different objects reflect different infrared light, different terrain can be recognized at night, and a large contrast can be obtained, easy to distinguish between the target and the background, green vegetation.

## Voice Recognition

The helmet has the independent headphones and stand out microphone. In this way, the users can easily hear from the helmet and let the helmet hear. The local memory space and AI function embedded in the helmet make the helmet stores and understands what users speak clearly and correctly with high efficiency.



Figure 4. Voice Recognition Function

## References

- [1] yi7. 2020. Digital night soldier goggles. [ONLINE] Available at: <http://www.yi7.com/sell/show-5321872.html>. [Accessed 22 April 2020].
- [2] gpcomm. 2020. dh-132 tank helmet headset with snake tube dynamic coil microphone. [ONLINE] Available at: <https://cn.ns2.gpcomm.cn/dh-132--p00082p1.html>. [Accessed 22 April 2020].



# The Elder Nursing Product

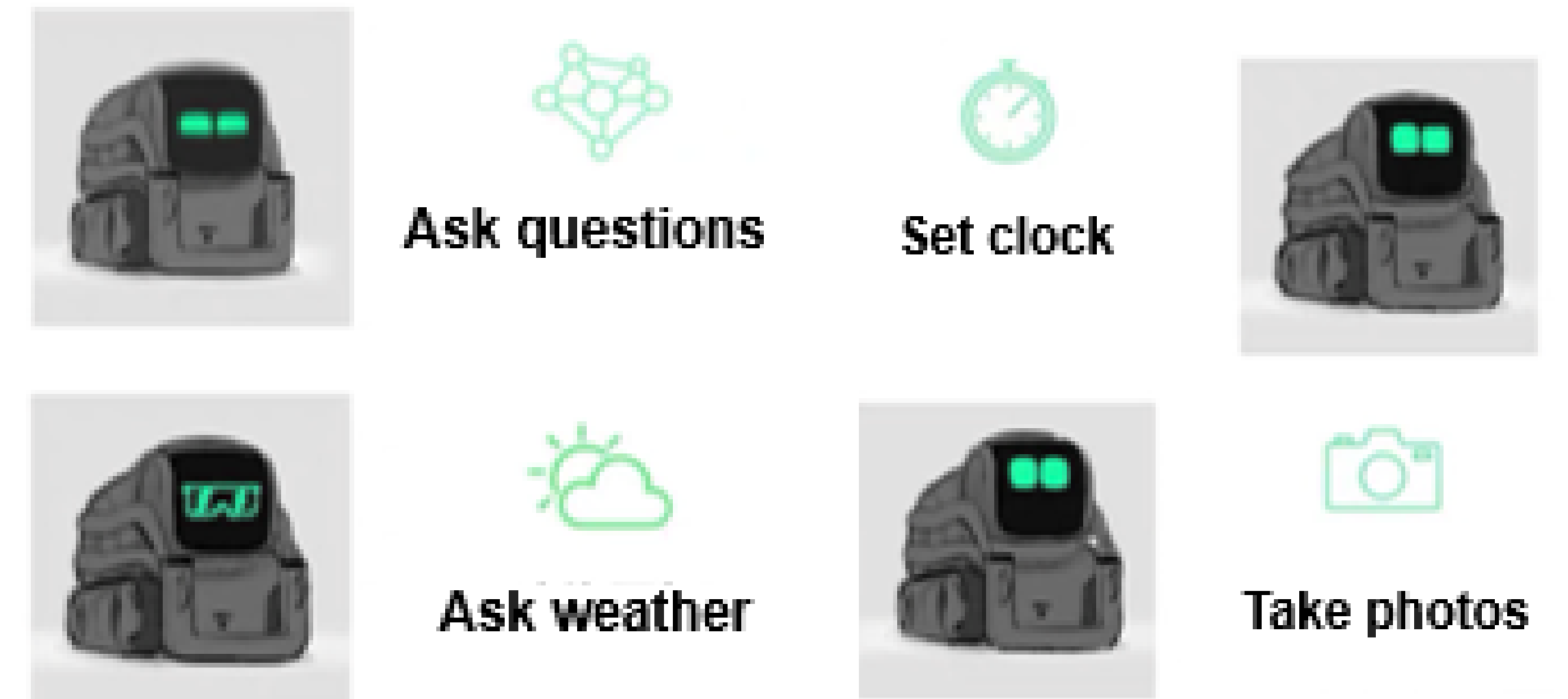
Group 80: Hangjiang Qi, Huicheng yu, Xiangji Kong, Bang Liu, Longxiang Chen

## Overviewing

There are two parts of our product, one is a full-scenario artificial intelligence robot and another is a smart wearable device. This product can accurately detect the physical condition of the elderly with limited mobility or no one to care for them, and send messages for help to the hospital or the children of the elderly in the case of emergency. It can greatly facilitate the care for the elderly while ensuring their safety. After all, with this product, we believe we could grab a large proportion in relative markets.

## intelligence robot

Our intelligent robot can follow the elderly, and can record to make some suggestions for the daily life of the elderly. In addition, intelligence also enables it to send instructions to the electronic products in the room through the Internet of things, which facilitates the life of the elderly. At the same time, the robot can detect the situation of the elderly in real time, and alarm automatically in case of crisis, which makes the product greatly convenient for the daily life of the elderly.



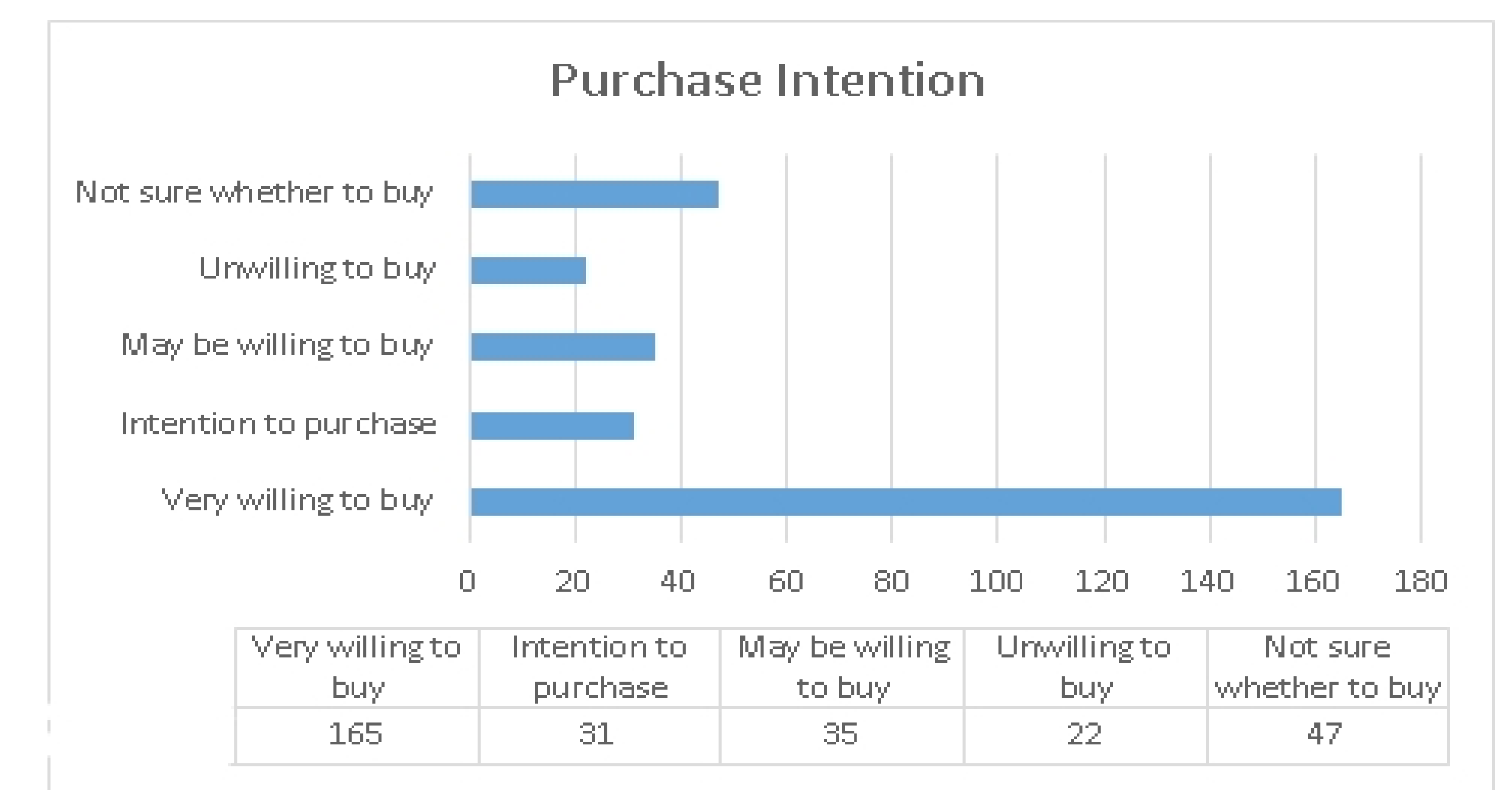
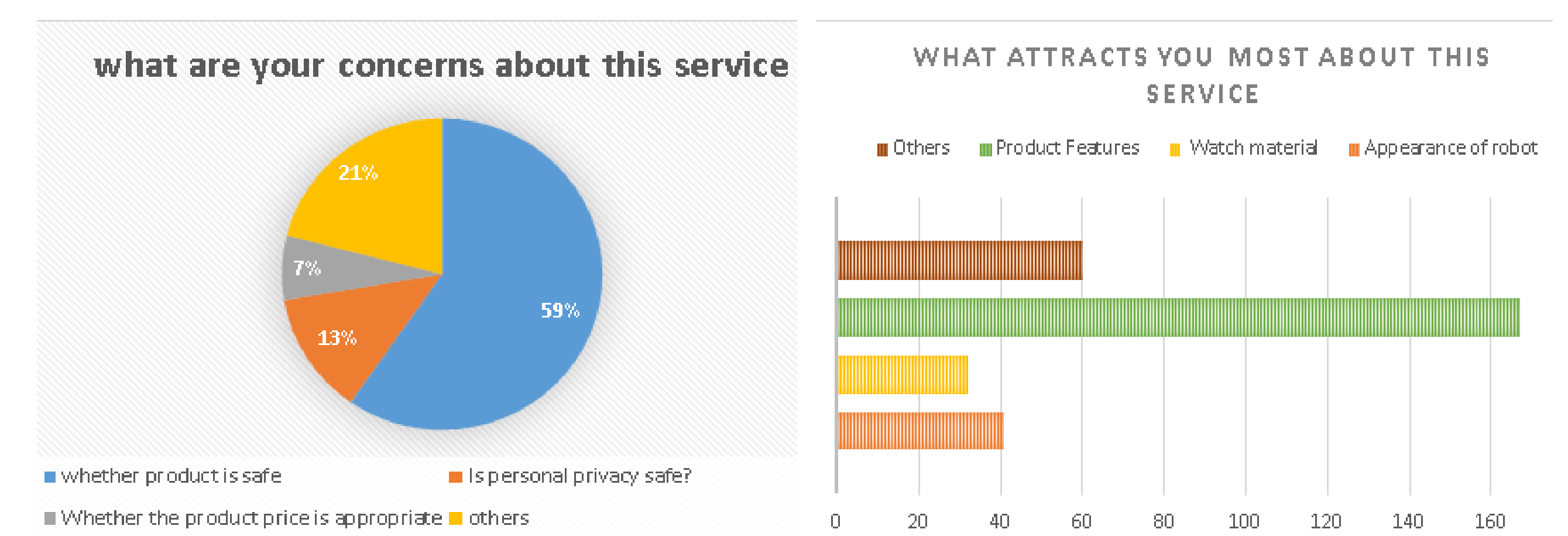
## other auxiliary equipment

It can be placed in different positions according to different functions, and can transmit data to the robot center, and then achieve some effects according to the instructions of the robot. The elderly can provide a series of data for the robot system, such as heart rate, blood pressure, etc. through wearing devices, while when abnormal, they can transmit information to the elderly or relatives through other devices. The robot can also accept the commands of the elderly through speech recognition, and adjust a series of data such as the brightness of the house and the temperature of the water heater in combination with the body data, so as to truly improve the living standards of the elderly.



## AI technique inside our products

In our robot, we mainly use the NRM technique based on NLP (natural language processing). The neural response machine (NRM) is a short text dialog response generator based on neural network developed in Hong Kong. It uses a universal codec framework. First, it formalizes the response generation into the decoding process based on the potential representation of the input text, and uses the recursive neural network to achieve the encoding and decoding. The NRM was trained in a large round of conversation data collected from the microblogging service. Empirical studies have shown that NRM can produce grammatically correct and content appropriate responses to over 75% of input text.



## References

- CSDN. 2020. Seven NLP technologies that will change the way you communicate in the future. [ONLINE] Available at: [https://blog.csdn.net/weixin\\_42398658/article/details/85384043](https://blog.csdn.net/weixin_42398658/article/details/85384043). [Accessed 14 April 2020].
- Zhang kun, rao yingqing, zhang mingyi, zeng haifeng, ma bing. Nursing robot based on modular design [J]. Electronic design engineering, 2008,26 (03) : 151-155 + 159.

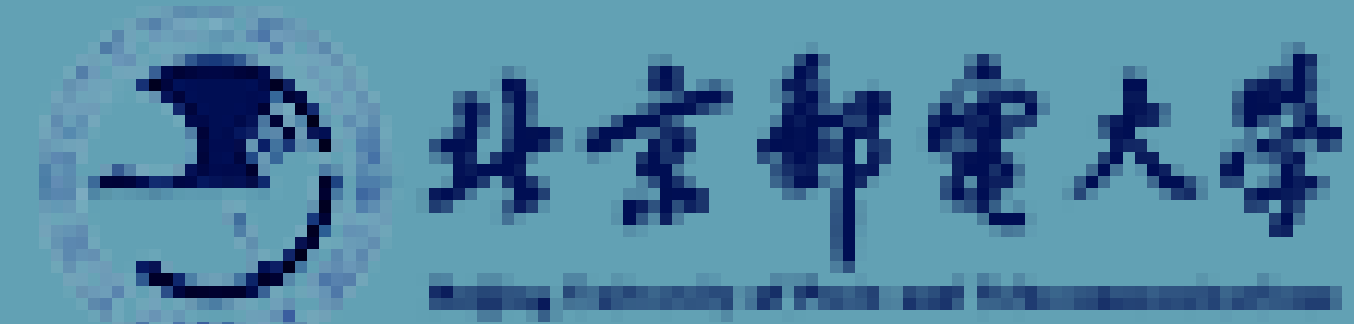


# AI elder caring robot

Group 88

Haobo Zhang 190012980, Yishan Wei 190015109

Senhao Wang 190014065, Shaulin Du 190014205, Jiaqi Li 190013286



## Elder caring robot

In contemporary society, population aging aggravates implying the old people's care is an inevitable business opportunity. If seizing the opportunity, the company will go far. The new elderly care robots developed by our development department have powerful functions with vision, hearing the smelling ability. Meanwhile, our robots have three main functions: routine physical examination, daily life care, emergency contact with self-cleaning, including most of the elder's needs. They're expected to be the most comprehensive intelligent, and to provide the most humanized service.

### Function1: Regular physical examination

The AI elderly-nursing robot carries out regular routine physical examinations, such as blood pressure and heartbeat to insure the health of users. When the old need to turn to doctors about health condition, the doctor who is contacted can reach physical examinations data of the aged asking for help and communicate with the elderly through the robot. Recording the physical examinations data, the robot will compare the latest examination data with previous one and analyze the difference and report abnormal changes to the specific doctor.



Figure 2. Regular physical examination.

### Function2: Daily life care

The robot is acquired to take care of the elders, in which the daily life care function is essential. This function should include these routines:

- The alarm clock (Wake-up alarm, Medicine Alarm, etc.)
- Sports assistance
- Regular medical care

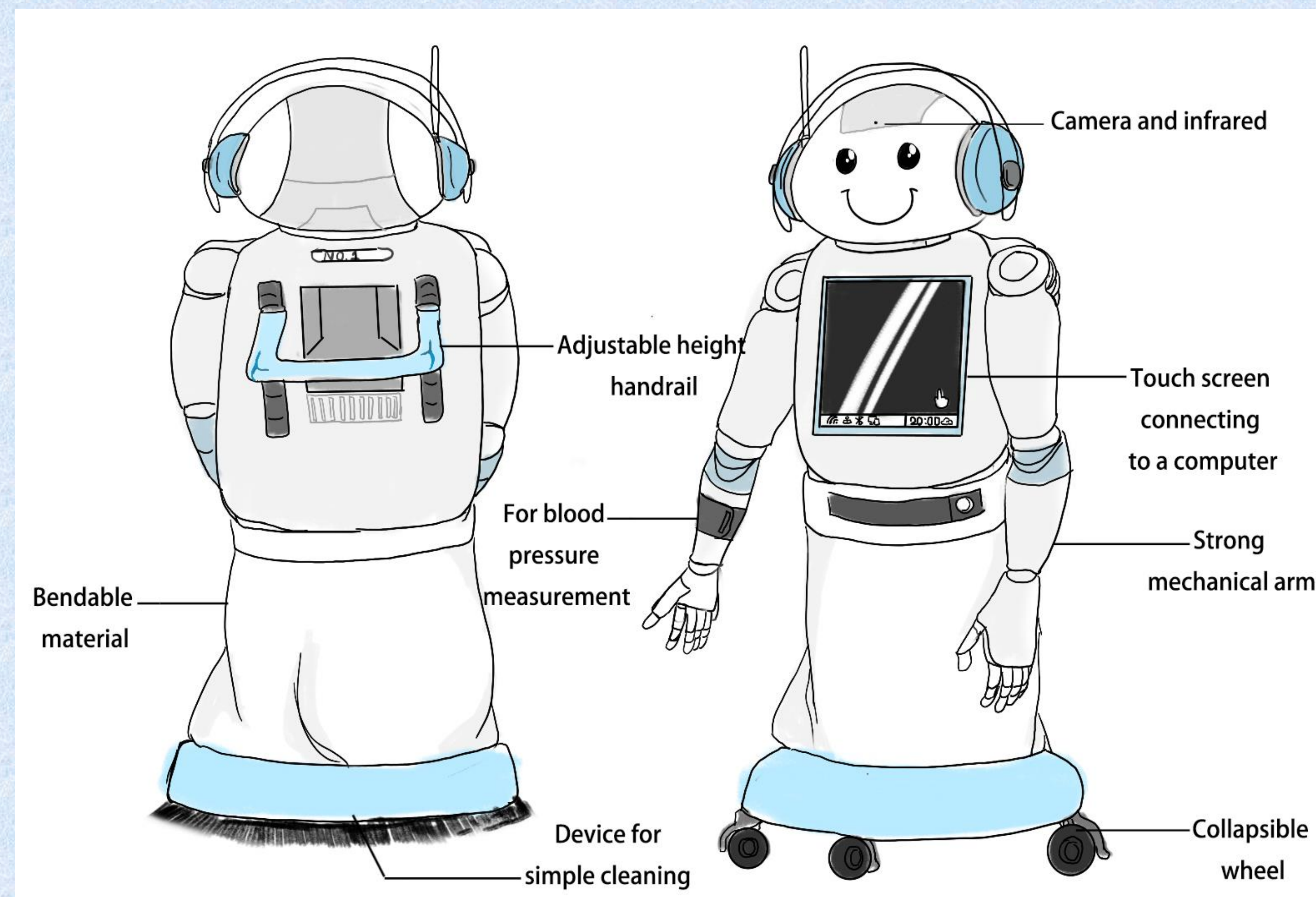


Figure 1. Concept of the robot.

### Function3: Emergency contact

**Emergency contact and self-cleaning** As the health butler of the old, the robot will check the general signs of health. They will have an emergency contact with hospitals, telling doctors the general information of the patient. What's more, the robot will clean itself everyday to make sure that every part is sterile. If you want a sterile room, especially during the epidemics, the robot is the best choose for you.



Figure 3. Daily life care

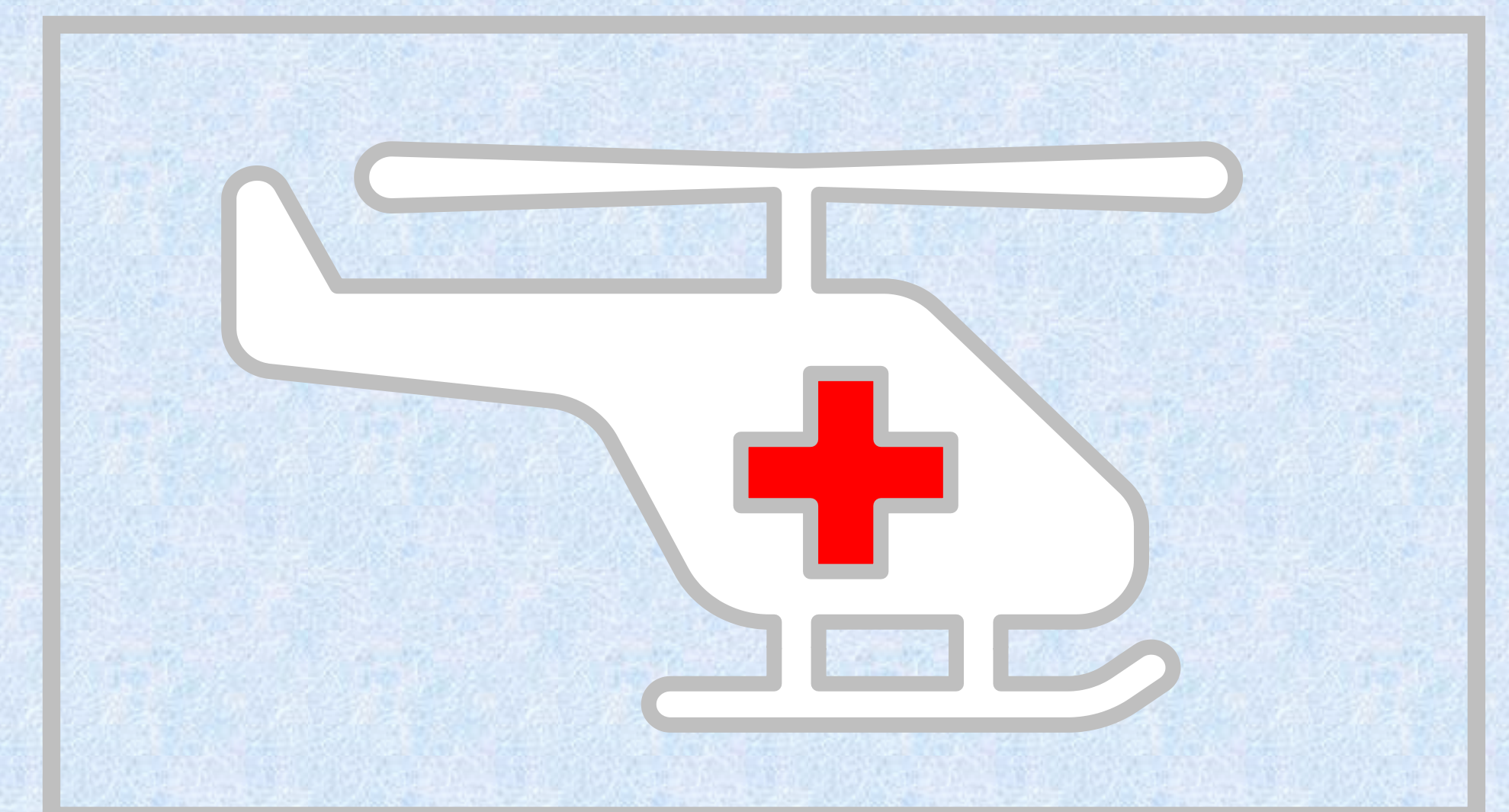


Figure 4. Emergency contact.

## Conclusion:

This robot has most of the functions from three aspects: medical, safety and care, which are in short supply on the current market. AI technology makes the realization degree of the product, and experience of the customers both improved. As China is entering an aging society, the market demand for this product is huge. Once the product gets the good feedback from users, its popularity will undoubtedly be in sight.

### Acknowledgments

This work was supported by the PRODUCT DEVELOPMENT AND MARKETING course and teachers.

### References

Ulrich, K. and Eppinger, S., 2012. Product Design and Development. 5th ed. New York: McGraw-Hill.

Welcome to EBU5606 Product Development and Marketing.2020. EBU5606 - PRODUCT DEVELOPMENT AND MARKETING - 2019/20.[ONLINE]Available at: <https://qplus.qmul.ac.uk/course>. [Accessed 20 March 2020].



# Intelligent Tennis Training System

Group 95

Boyang Zhang, Shunping Yang, Xinran Wang, Yue Gu, Kaiyi Zhao

## Overview

Our intelligent tennis training system, including software system and hardware system, provides tennis enthusiasts with an optimal environment for tennis training that covers teaching, social and other functions. Our intelligent tennis training system is designed to assist them to enjoy doing sports scientifically and correctly.

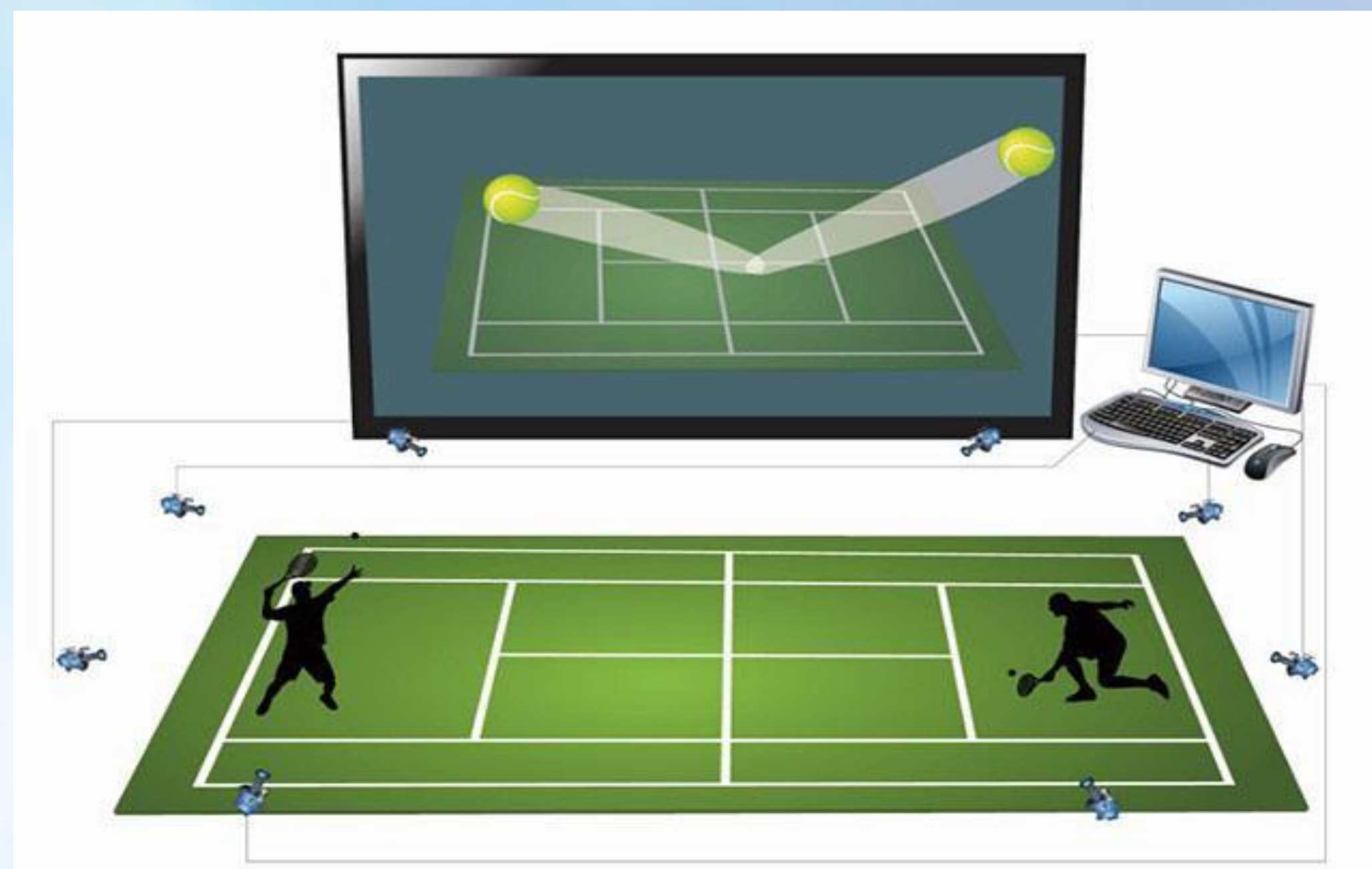


Figure 1. Training ground diagram.

## Physical Equipment

We made careful selection among the racket material and the type of camera. We decided to use Kevlar mixed with Nylon as the material of racket line considering its durability and burliness, use Glass Fibre to make the rack itself since it is relatively cheap and has a higher damping capacity. We implemented infrared night vision waterproof camera to accommodate changeable circumstances. We have also included sportswear selling services and developed some corresponding wearing devices.

“Glass fiber” is an inorganic nonmetallic material with excellent performance and a wide variety of advantages, such as good insulation, strong heat resistance, good corrosion resistance and high mechanical strength. (Wikipedia, 2020)

“Kevlar” due to its low density, high strength, good toughness, high temperature resistance and ease of processing and forming, the new material is five times as strong as steel of the same quality, but only one-fifth as dense. (Wikipedia, 2020)

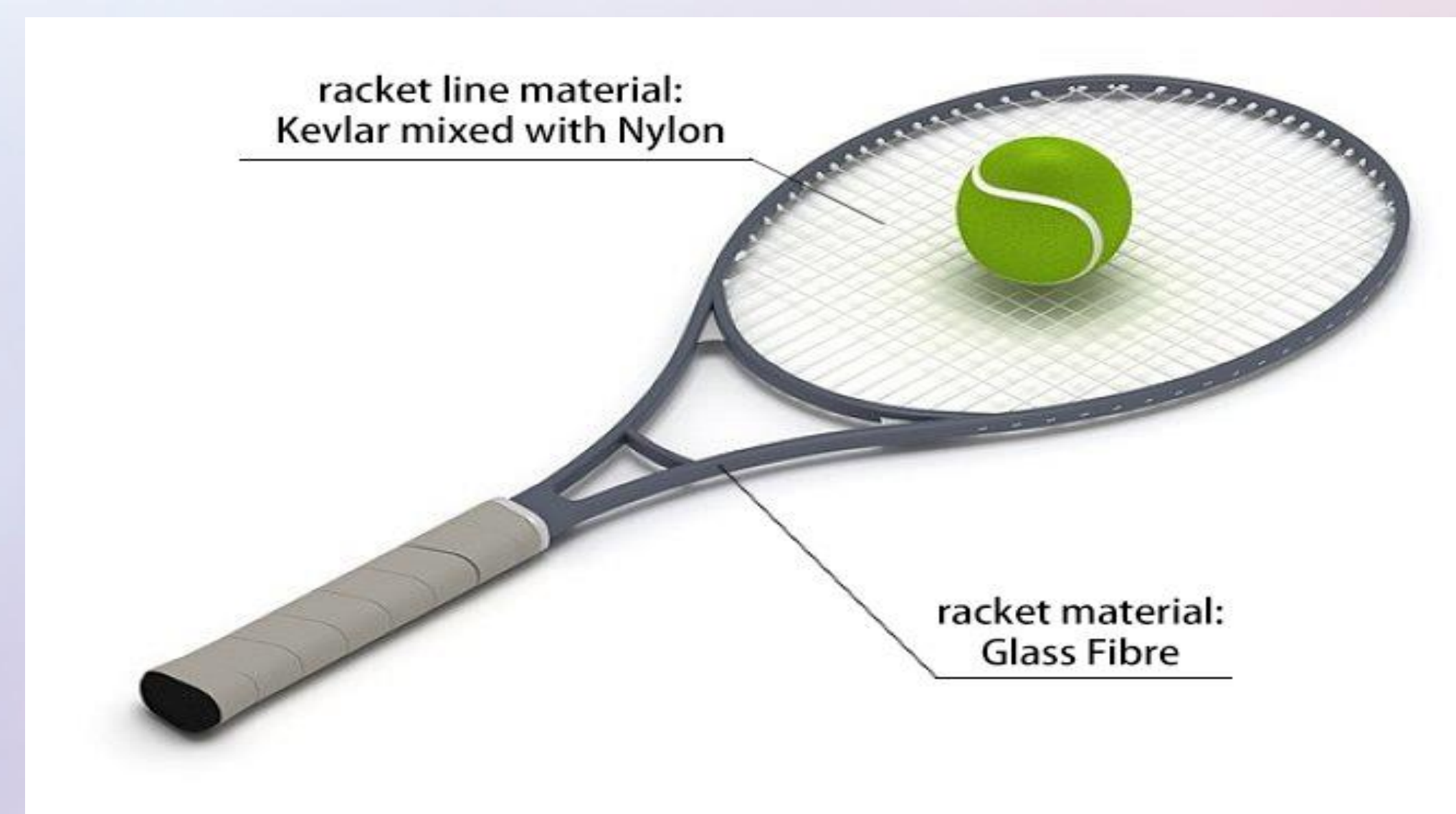


Figure 2. tennis racket preview

Infrared night vision waterproof camera is mainly used in the dark environment where there is no visible light or low light. Infrared light is actively projected onto the object by the infrared transmitter. Infrared light is reflected by the object and then enters the lens for imaging. What we see is a reflection of infrared light, not visible light, which allows us to take pictures that are invisible to the naked eye in dark environments.



Figure 3. Infrared night vision camera.

## Software Equipment

We designed a software system that is suitable for the hardware system. Its functions contain: real-time monitoring and analysis of movements, timely correction of users' wrong movements, action playback, personalized customization of users' training plan, communication with friends and booking matches, etc. We combined clouding processing and terminal processing to accelerate motion analyzing speed. We decided to use pop-ups on screen to give players in time feedback without influence them because both voice reminder and vibration reminder will Interfere athletes during the play.



Figure 4. APP's interface

## Socialization

We allow users to join in tennis club online and communicate with other players to form their own "tennis friend zone". Users can have free access to tennis teaching courses both online and offline. We also offered the opportunities for customers to make appointments with your opponents to schedule matches. In brief, we are supplying a platform for our customers to really engaged in this sports and improved themselves by exchanging experience so that they will eventually enjoy themselves and harvest valuable friendship.

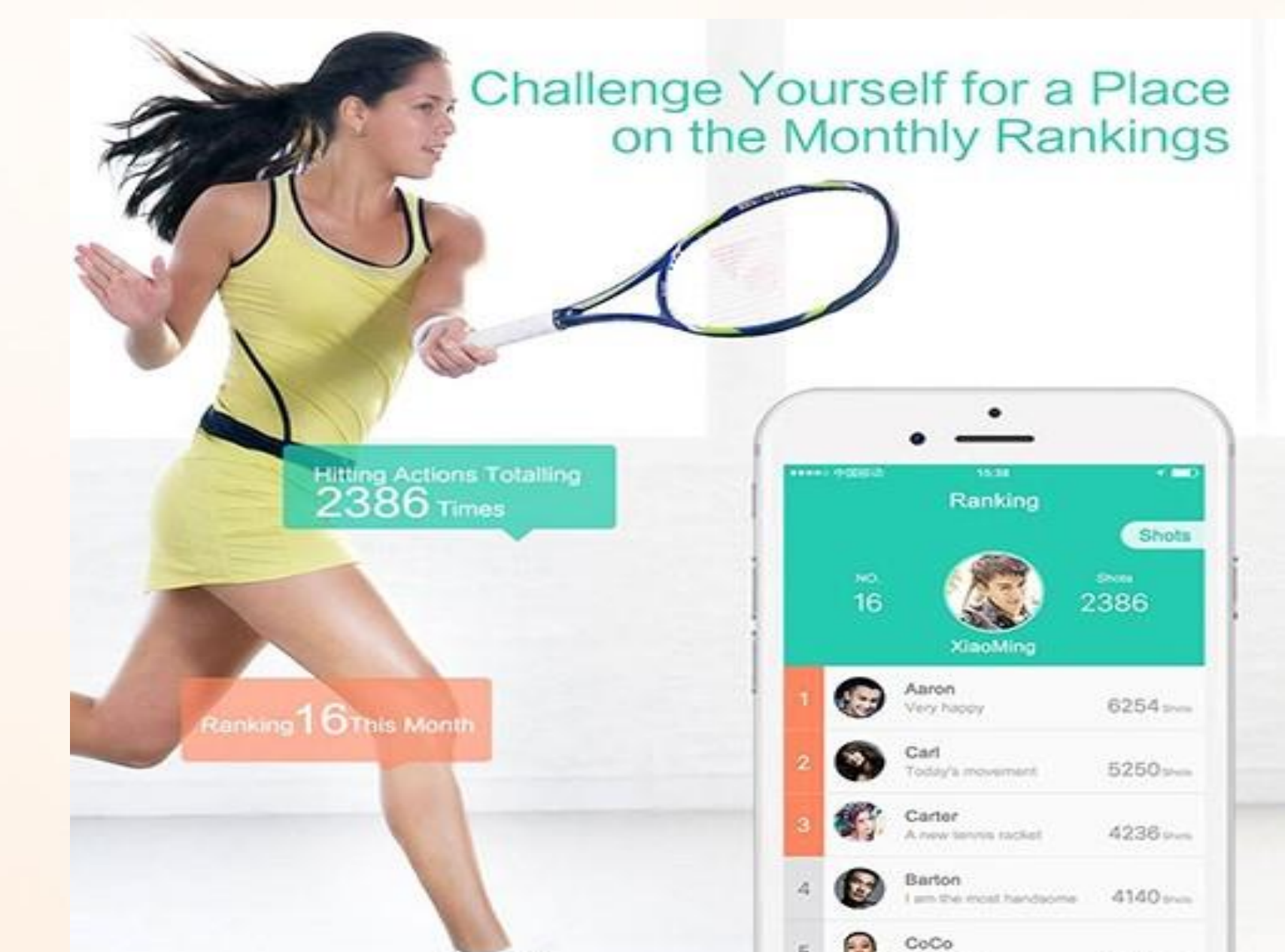


Figure 5. The social interface of the software.

## References

1. Wikipedia,2020. Wikipedia. [Online] Available at: [https://en.wikipedia.org/wiki/Glass\\_fiber](https://en.wikipedia.org/wiki/Glass_fiber) [Accessed 18 4 2020].
2. Wikipedia, 2020. Wikipedia. [Online] Available at: <https://en.wikipedia.org/wiki/Kevlar> [Accessed 18 4 2020].