

Aurapods

Second-hand Smoke Purification Earphones

HCI Design · UX Design · Individual Project

Aurapods is a multi-mode, transformable device that integrates everyday headphones with portable air-purification technology, providing users with immediate and controlled protection from secondhand smoke in both mobile and stationary contexts. With three modes—Regular, Mobile Purification, and Space Purification—Aurapods seamlessly shifts between daily listening, filtering “drifting smoke” in public spaces, and functioning as a compact desktop purifier. The system visualizes purification data to reveal the amount of harmful substances filtered over time, raising awareness of the dangers of secondhand smoke. Centered on context-aware interaction, this design explores new possibilities for wearable devices at the intersection of personal health protection and public health advocacy.



Inspiration

I am a victim of second-hand smoke. Both my mother and I suffer from **asthma** and **bronchitis**. My father likes to smoke at home, which made me stay in the dormitory during my college holidays and seldom go home. Even if I don't go **home**, when I'm walking on the **street**, there will still be people smoking.



When I'm having a meal, the people at the next table smoking forces me to give up my meal and leave the **restaurant**. I need a device that can protect me from the harmful effects of second-hand smoke, and also keep my family and other victims of second-hand smoke away from the health risks caused by it.

Background Research



In China, **740 million** people are suffering from the effects of second-hand smoke. The number of people **killed** each year because of second-hand smoke exceeds **100,000**.

The youngest lung cancer patient in China was only **2 years old**. Died from his father's second-hand smoke. Children are being massacred by second-hand smoke.

In China, over **50% of women** of childbearing age are exposed to second-hand smoke. The substances can cause genetic mutations, premature birth and even death.

Global Populations Affected by Secondhand Smoke

Harmful Substances in Smoke
Nicotine, Carbon monoxide

Respiratory System
Respiratory irritation Children: asthma, lung cancer(+20-30%)

Circulatory System
Cardiovascular: heart disease

Stroke Respiratory
chronic bronchitis COPD throat cancer

Death
About 65,000 children/year
About 1.2 million total /year

CHILJDREN

about 40% worldwide

about 65000 children

PREGNANT WOMEN

about 50% in China

OVER 10.85 million unborn

ADULT NONSMOKER

about 45% low-income

ABOUT 7300 lung cancer death

GLOBAL OVERALL

about 1.2 billion death

Among them are 65,000 children.

The most significant health threat - the lungs

The chemicals in second-hand smoke can irritate the mucous membranes of the **bronchi**, leading to chronic inflammation and swelling.

8 million people die from tobacco-related diseases each year, among which **1.3 million** are non-smokers.

Secondhand smoke can reduce the function of alveolar macrophages.

Secondhand smoke irritates the alveolar epithelial cells, leading to an inflammatory response.

The free radicals and toxic chemicals in second-hand smoke will attack the elastic fibers of the **alveoli**.

Secondhand smoke can stimulate the epithelial cells in the alveoli, triggering an inflammatory response, which leads to the production of mucus.

The alveoli, which were originally filled with air, will become clogged due to the accumulation of liquid, preventing oxygen from entering and making it impossible for carbon dioxide to be exhaled.

City	Smoking causes lung cancer	Smoking causes heart attack	Smoking causes stroke	Smoking causes impotence
Tangshan	95%	65%	50%	25%
Tianyan	95%	65%	50%	25%
Luoyang	95%	65%	50%	25%
Shenzhen	95%	65%	50%	25%
Shenyang	95%	65%	50%	25%
Nanchang	95%	65%	50%	25%
Hannyeoa	95%	65%	50%	25%
Hangzhou	95%	65%	50%	25%
Changchun	95%	65%	50%	25%

Policies to eliminate second-hand smoke

Global Tobacco Control Policies

- Comprehensive Smoking Bans in Public Places
- Generational / Lifetime Smoking Bans
- Heavy Fines and Criminal Liability
- Economic Measures: High Taxes & Tariffs
- Equal Regulation for E-cigarettes
- Positive Incentives for Quitting

Maldives (Born after 2007: lifetime ban)

UK (Indoor smoking ban)

Spain (Fines up to €600,000)

Thailand (Outdoor fines 2,000 baht)

Bhutan (Nationwide, no exemptions)

Singapore (Repeat offenders: 1-year prison)

Macau (No signage: fine MOP 100,000)

Bhutan (200% import tariff)

Sweden (High tax, smoking rate ~5%)

France (E-cigarettes same ban & tax)

Japan (Nicotine e-cigs as drugs, train ban)

South Korea (Paid quit-smoking leave)

Ban on advertising, promotion, sponsorship

Mandatory graphic health warnings

Ban sales to minors

The implementation status of relevant policies

Industry resistance: Tobacco companies spend 8 billion dollars on advertising each year, using tactics such as litigation and lobbying to delay policy changes.

Electronic cigarettes are rapidly spreading among teenager and there is a lack of regulation or lagging law enforcement, which has offset the decline in traditional cigarettes.

The gap in smoking rates is primarily due to the disparity in enforcement; To further reduce the rate, it is necessary to transform "paper regulations" into "daily enforcement".

Conclusion

According to the latest WHO report, 71% of the global population is now covered by at least one tobacco-control measure—five times the proportion in 2007. Yet tobacco use still claims around 8 million lives every year, including 1.3 million non-smokers exposed to second-hand smoke. Protecting the respiratory health of non-smokers therefore remains a critical and urgent need.

Speculation and Strategy

PLAN A Neck-mounted air purifier



Similar to the centrifugal turbine of the neck-mounted fan, the turbine is filled with blades. The turbine rotates and drives the blades to rotate, thereby cutting the wind into small pieces.

Reduce the discomfort of wearing and minimize the awkwardness during social interactions.

PLAN B Headphone purification mask



The weight of the filter cartridges (6001-CN) on both sides alone amounts to 180 grams.

The overall weight is around 300 grams.

The form is overly exaggerated.

Maximize the filtering effect, but it is cumbersome and unattractive. Difficult to wear and not suitable for social occasions

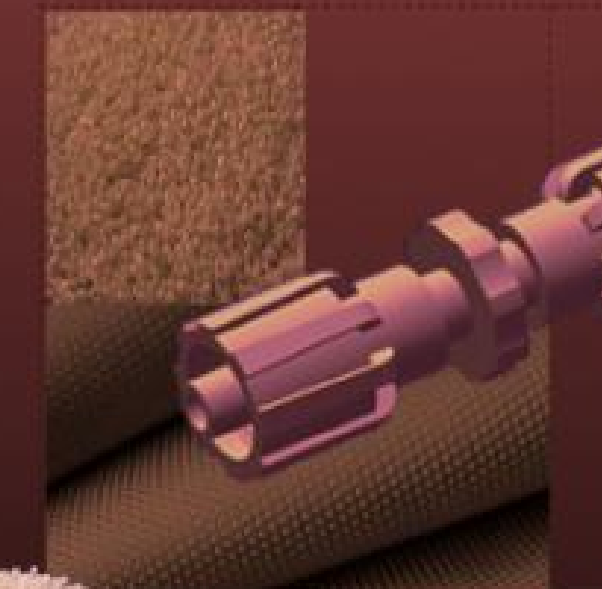
PLAN C (final choice) Modular earpiece air purifier



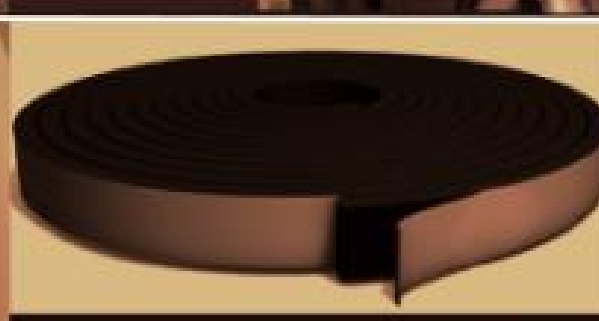
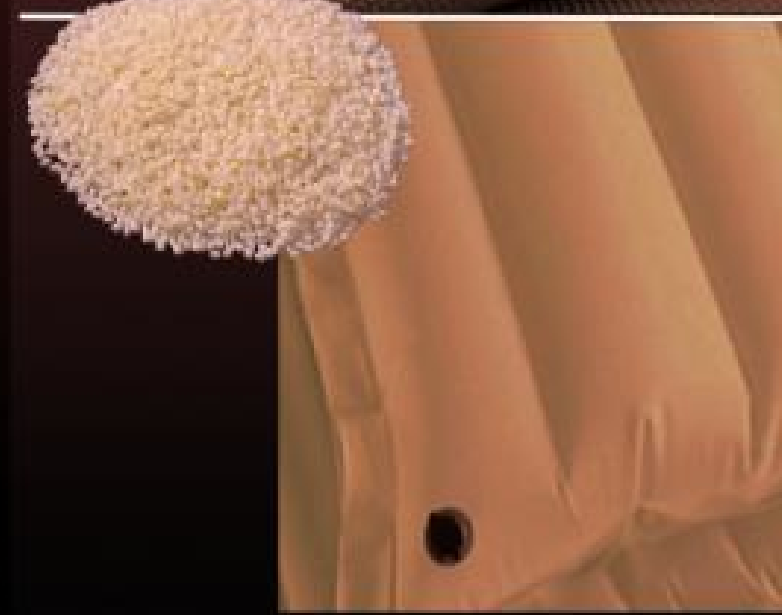
When there is no second-hand smoke, Aurapods return to earphone form.

- With the core concept of "cooperative protection", this product combines the high-frequency daily device of headphones with micro air purification technology.
- It enables the act of protecting air quality to naturally integrate into users' daily commuting and study lives.

Technical Support



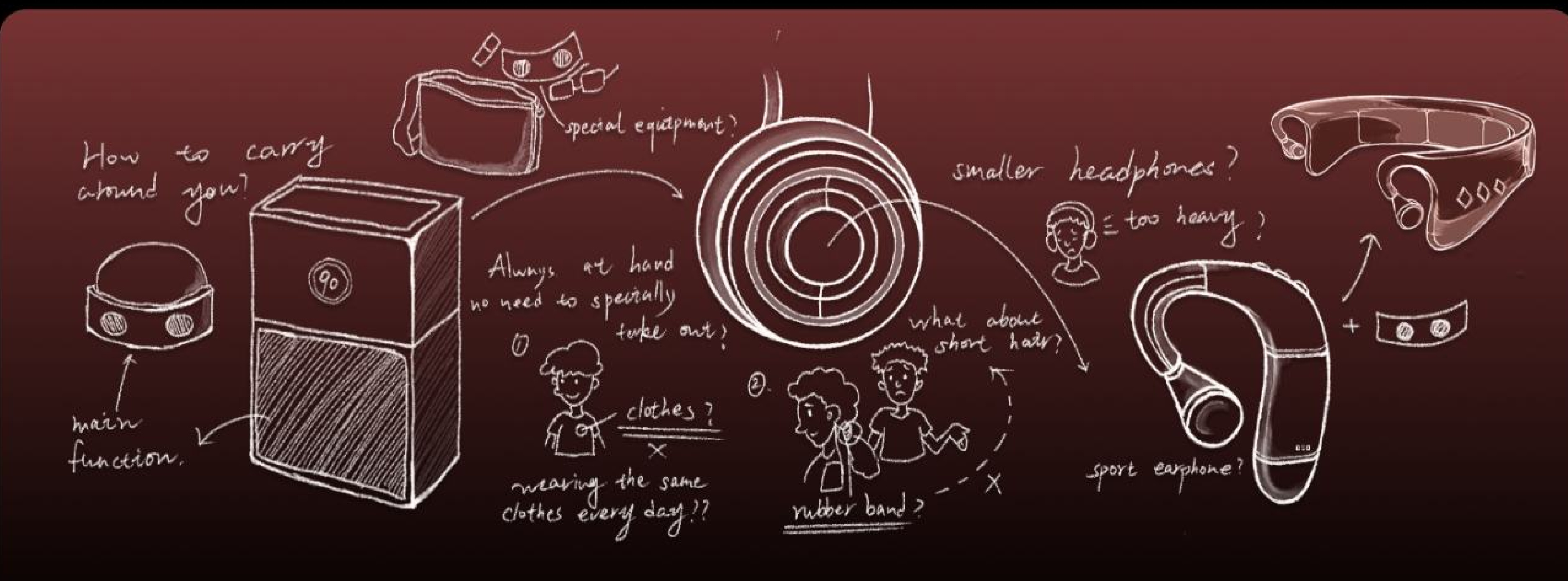
Captures the signal of second-hand smoke exposure through the dust sensor



filter element

Filter out the toxic gas through activated carbon.

Product Iteration Process



How to carry around you?

special equipment?

smaller headphones?

Always at hand no need to specially take out?

clothes?

wearing the same clothes every day??

what about short hair?

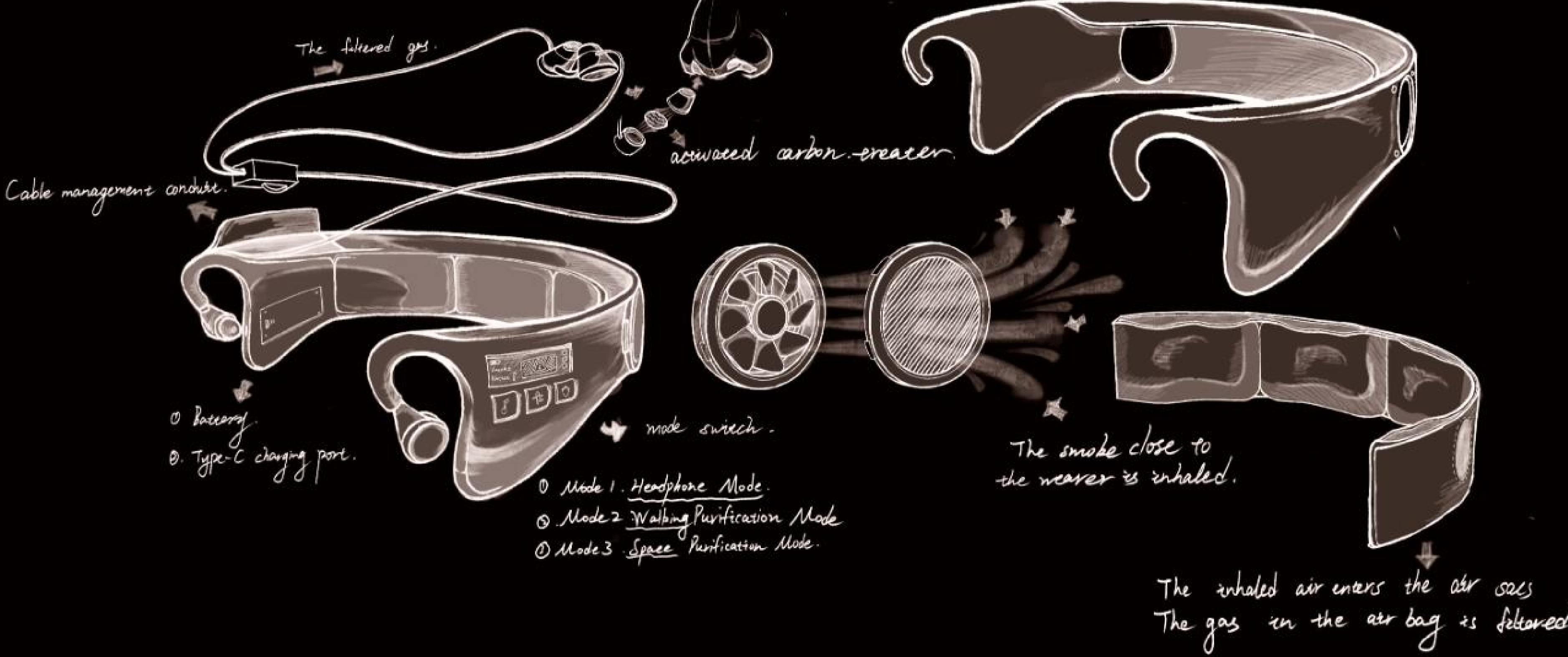
rubber band?

sport earphone?

too heavy?

main function.

Sketch



The filtered gas.

activated carbon-creator.

Cable management: conductive.

mode switch.

The smoke close to the wearer is inhaled.

The inhaled air enters the air sacs. The gas in the air bag is filtered.

① Recovery

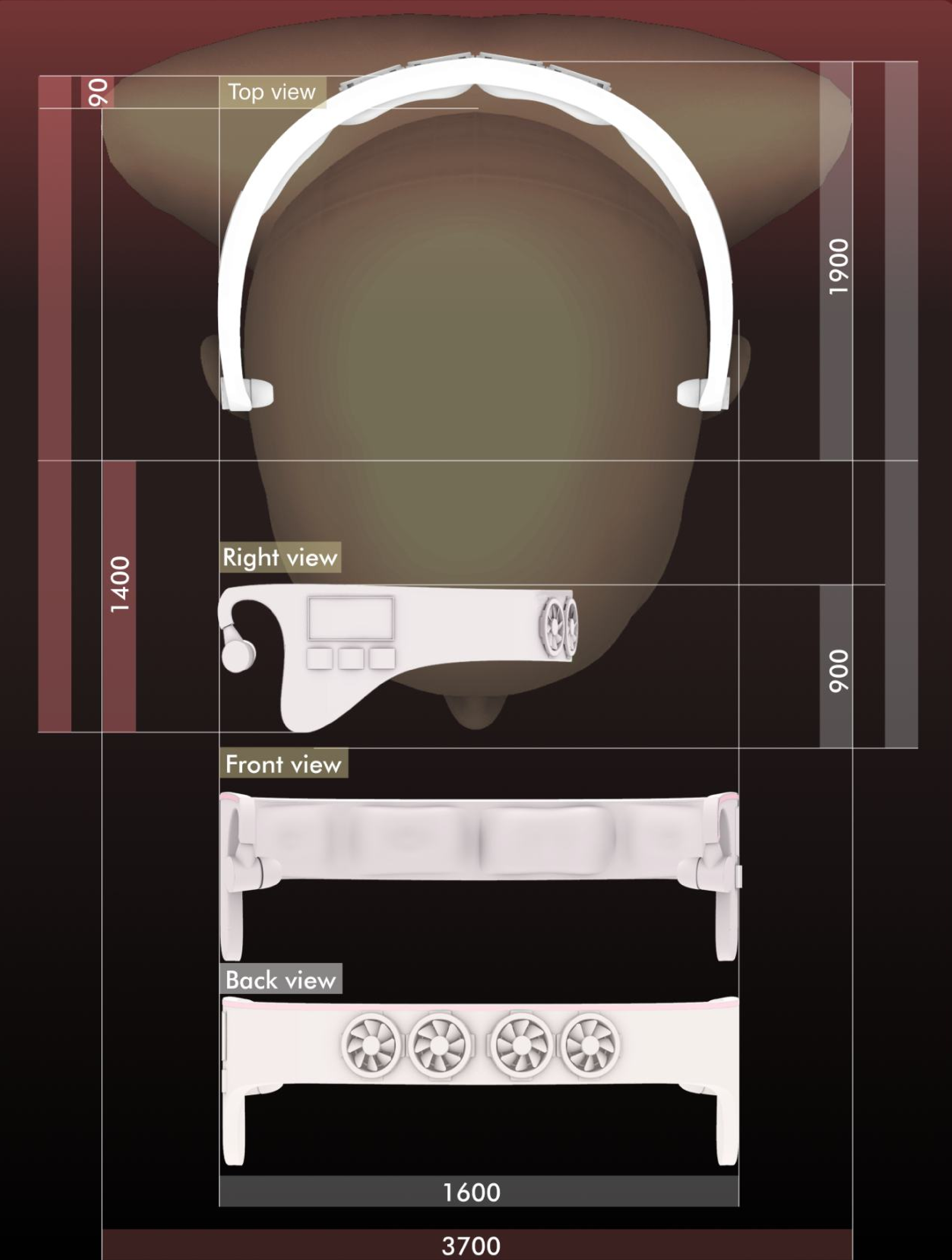
② Type-C charging port.

① Mode 1: Headphone Mode

② Mode 2: Walking Purification Mode

③ Mode 3: Space Purification Mode

Three-view drawings and scale



Top view

Right view

Front view

Back view

90

1900

1400

900

1600

3700

Function A -Mobile Purification-mode

STEP1

Press the purification mode, the storage box will pop open.

STEP2

Open the storage box, remove the wire and the filter tube.

STEP3

Bring the purification tube and use your application or button to adjust the purification parameters.

Reserve the thickness for real human hair

Function B - Regular Earphone Mode

Wear the headphones, press the earplugs against the ear canal or adjust the ear cups to a comfortable position.

Connect to Bluetooth and use the music app to play music.

The airbag is set to the inflated state, ensuring a comfortable fit for the headphones.

Function C - Space Purification Mode

Remove the headphones, place them upside down on the dining table, turn on app, and switch to the space purification mode.

The fan sucks in the air around the wearer of the device, which contains second-hand smoke, into the airbag.

At this moment, the headphones have transformed into a small air purifier that can purify the air in a local area.

Product Rendering

The form of the sports headphones is fixed on the head.

When not in use, the purification tube is stored at the upper edge of the headphones. When it is needed, the cover is opened and the tube is withdrawn.

Functional Prototype

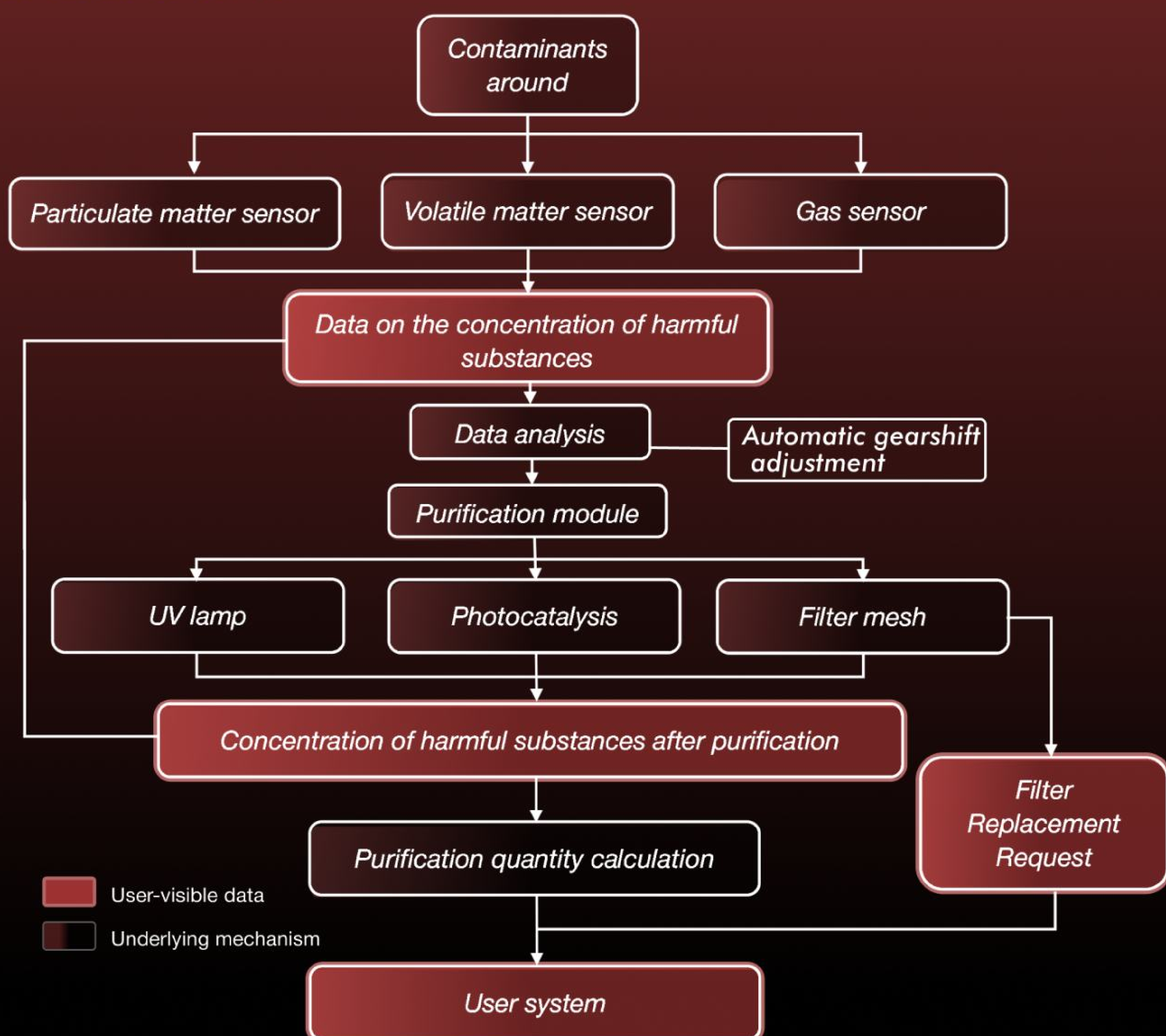
Using 3D printing technology, we printed the model created in Rhino.

The breathing tube is modified from a nasal oxygen cannula and is made of silicone.

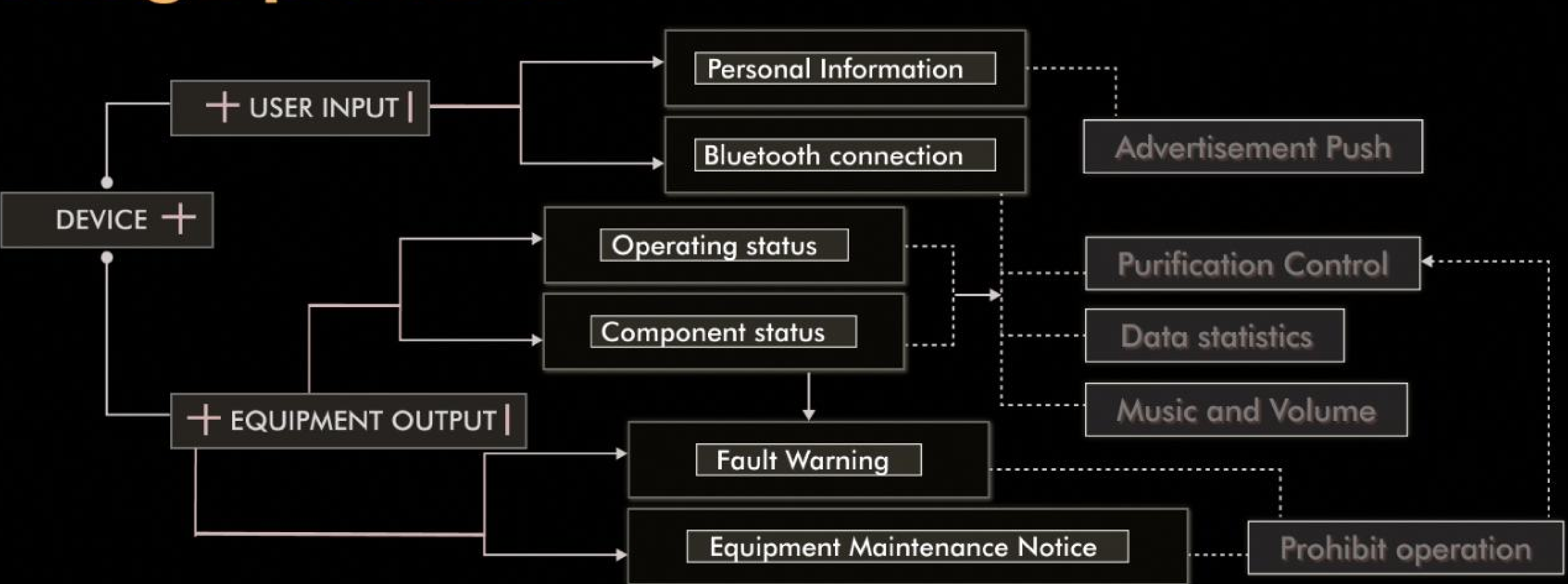
The model is made of resin material and has a certain degree of flexibility, allowing it to fit closely to the head when worn.

Metallic spray paint and plastic film were used to simulate the surface materials of the airbag and the headphones.

Data Flow



Usage process



Step1 Register & Connecting Device

Register screen showing fields for Sur Name, Given Name, Gender, E-mail, and a Next Step button.

Personal Information

Users start by entering basic details.

Hi, Sasha screen showing Version, Purchase Place, and a Next Step button.

Device Details

Users select their device model and purchase location.

Setup password screen showing User ID, Password, and Confirm password fields, with a Next Step button.

Create Password

A user ID is generated automatically, and users set their password.

Login in screen showing User ID and Password fields, with a Next Step button.

Log In

Returning users can log in directly.

Step2 Control the device

Introduction Page showing AuraPods 1.1.1 version, new products, and selection options.

Introduction Page

Introduce the usage methods of the equipment and the new equipment

Choose mode screen showing Purification mode, Wind Speed, and Automatic Mode sliders.

Choose mode

Switch to the purification mode and manually adjust the purification parameters

Lock mode screen showing Purification mode, Wind Speed, and Automatic Mode sliders.

Lock mode

Switch to the automatic mode, and the system will automatically adjust the purification parameters.

Adjust volume screen showing Purification mode, Volume, and Denoise sliders.

Adjust volume

When there is no second-hand smoke, you can adjust the parameters of the headphones.

Step3 Real-time Monitoring

Home page showing Hello, Sasha! and current air quality score (80 points).

Home page

Users can open the homepage, and see the purification situation.

Details screen showing Loading Of Air Pollutant and current environmental pollution level.

Details

Click on each type of harmful substance to view details.

Notice screen showing a filter replacement notice and a discount coupon.

Notice

The system will notify the lifespan of the activated carbon filter.

Advertisement screen showing a discount coupon for purchasing new equipment.

Advertisement

Receive the discount coupon for purchasing new equipment!

Settings and Help

App Settings screen showing language and profile picture options.

App Settings

Set the details of the app, such as the language and the profile picture.

Personal information screen showing user profile and device connection options.

Personal information

On the profile page, users can view their personal information.

Device connection screen showing a list of connected devices.

Device connection

Automatically connect one's own device or connect a new device

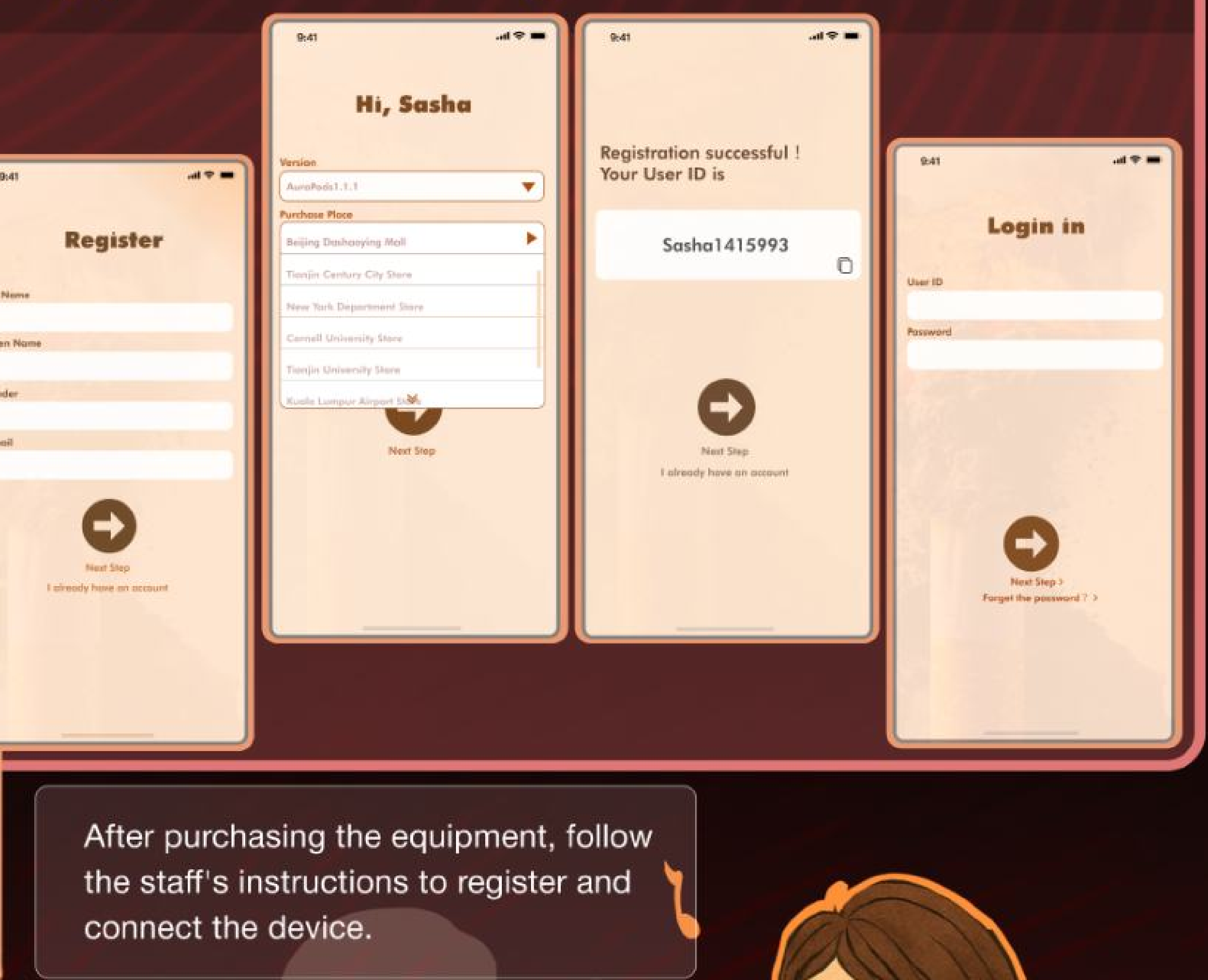
AI assistant consultation screen showing a chat interface for user assistance.

AI assistant consultation

When encountering usage problems, seek help from the AI assistant

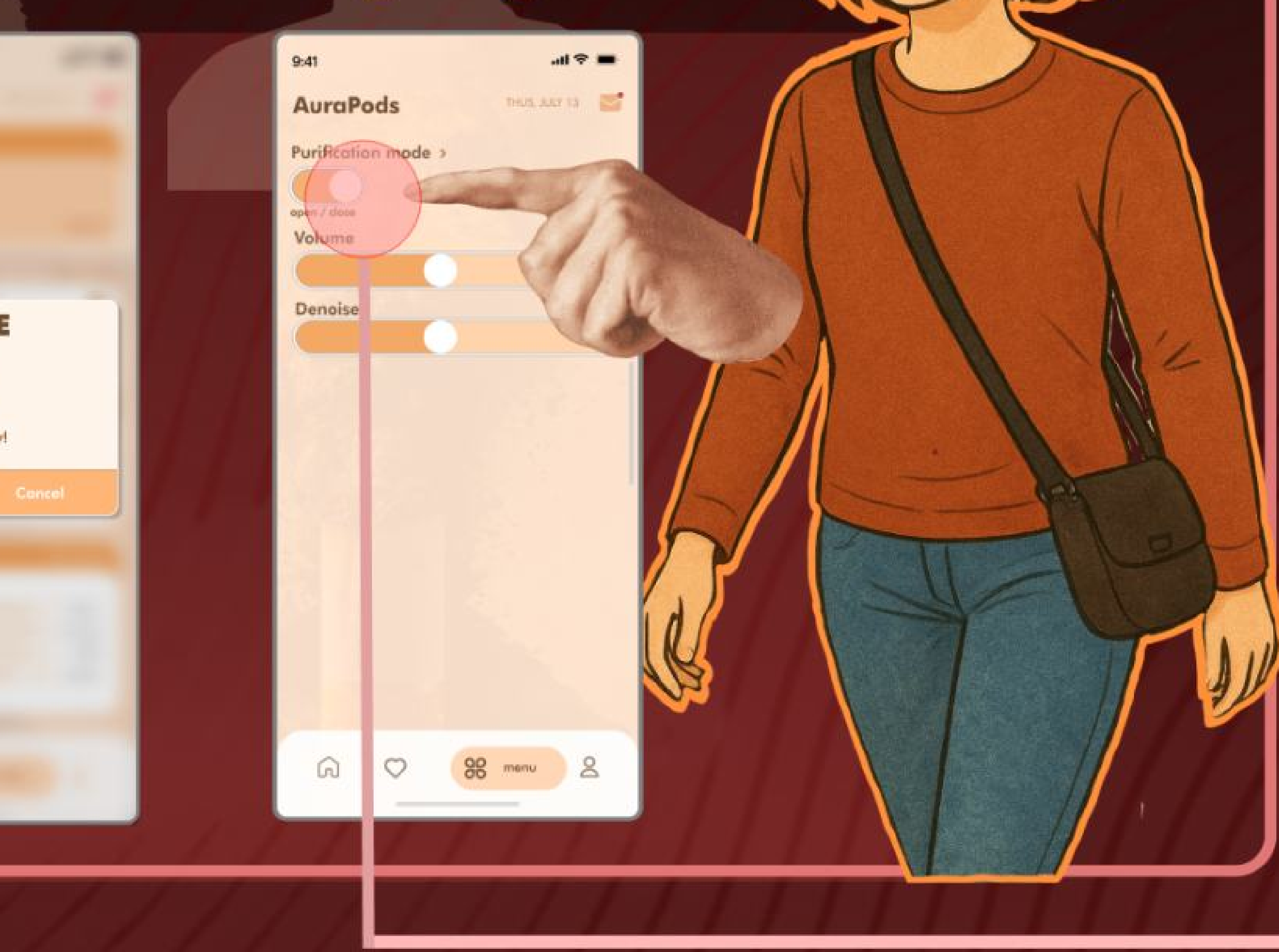
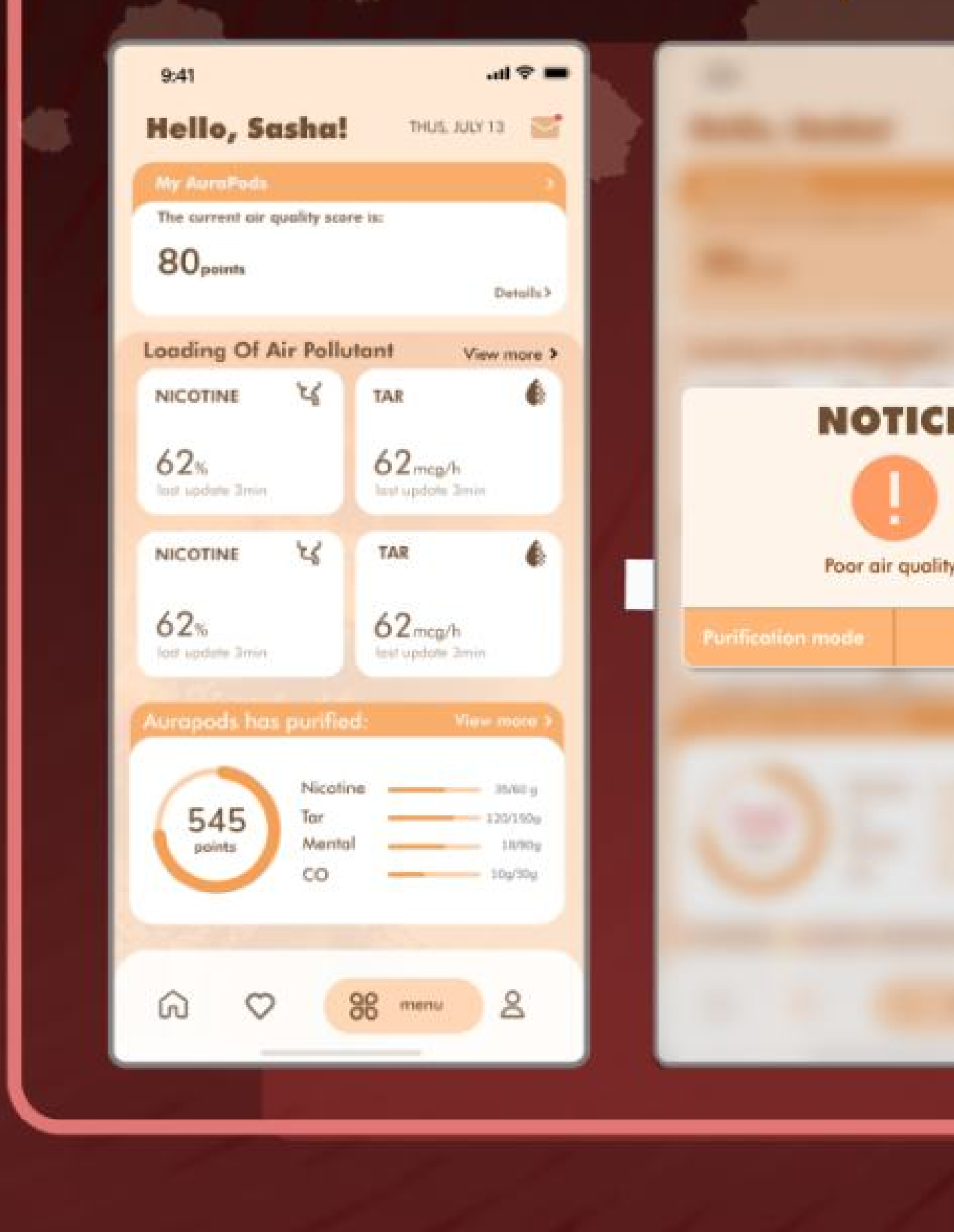
Usage Process

STEP1-Download the application & Register



After purchasing the equipment, follow the staff's instructions to register and connect the device.

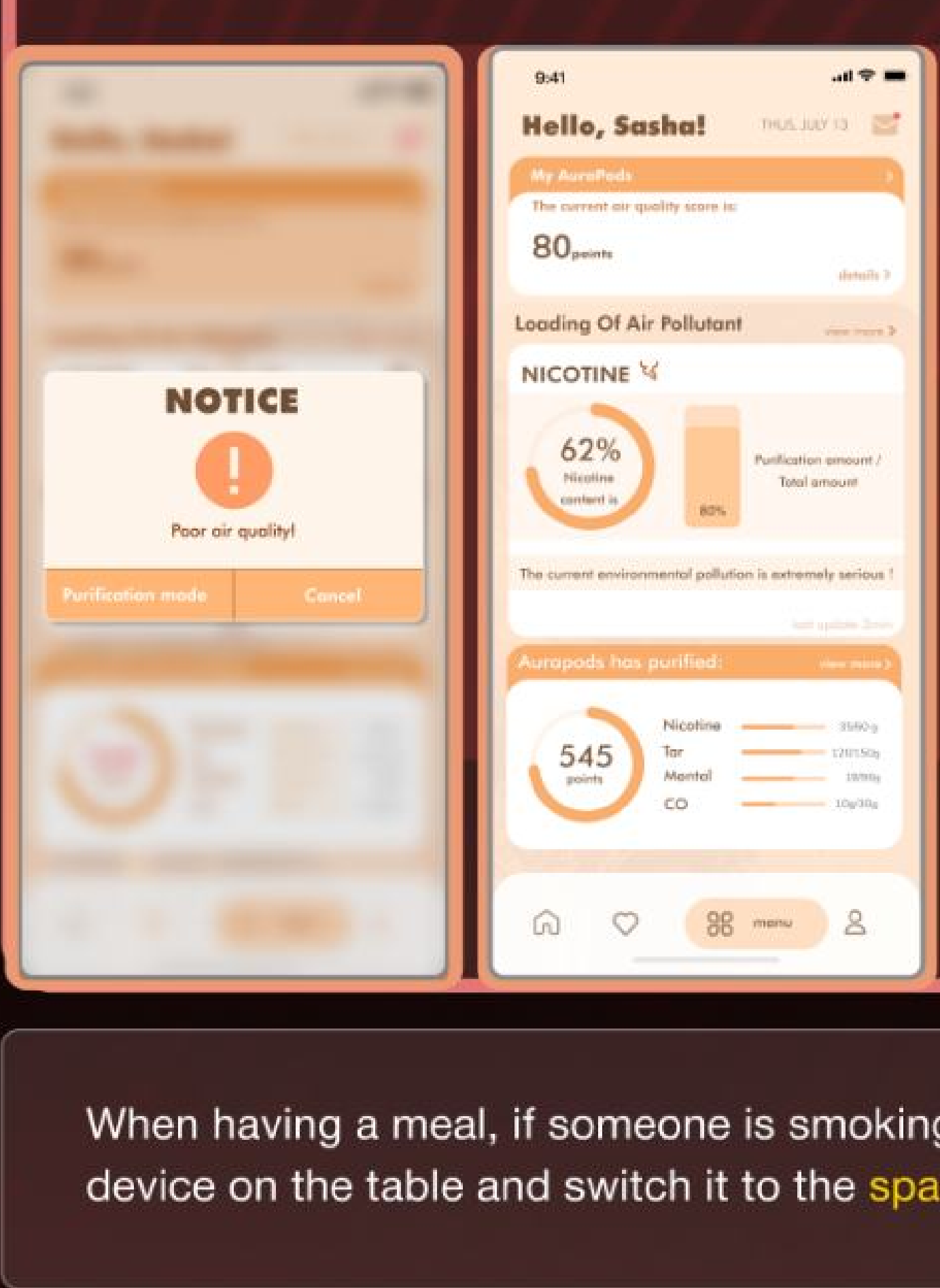
STEP2-Wear headphones when going out



When there is no second-hand smoke, while walking on the street, wear headphones and enjoy the music.

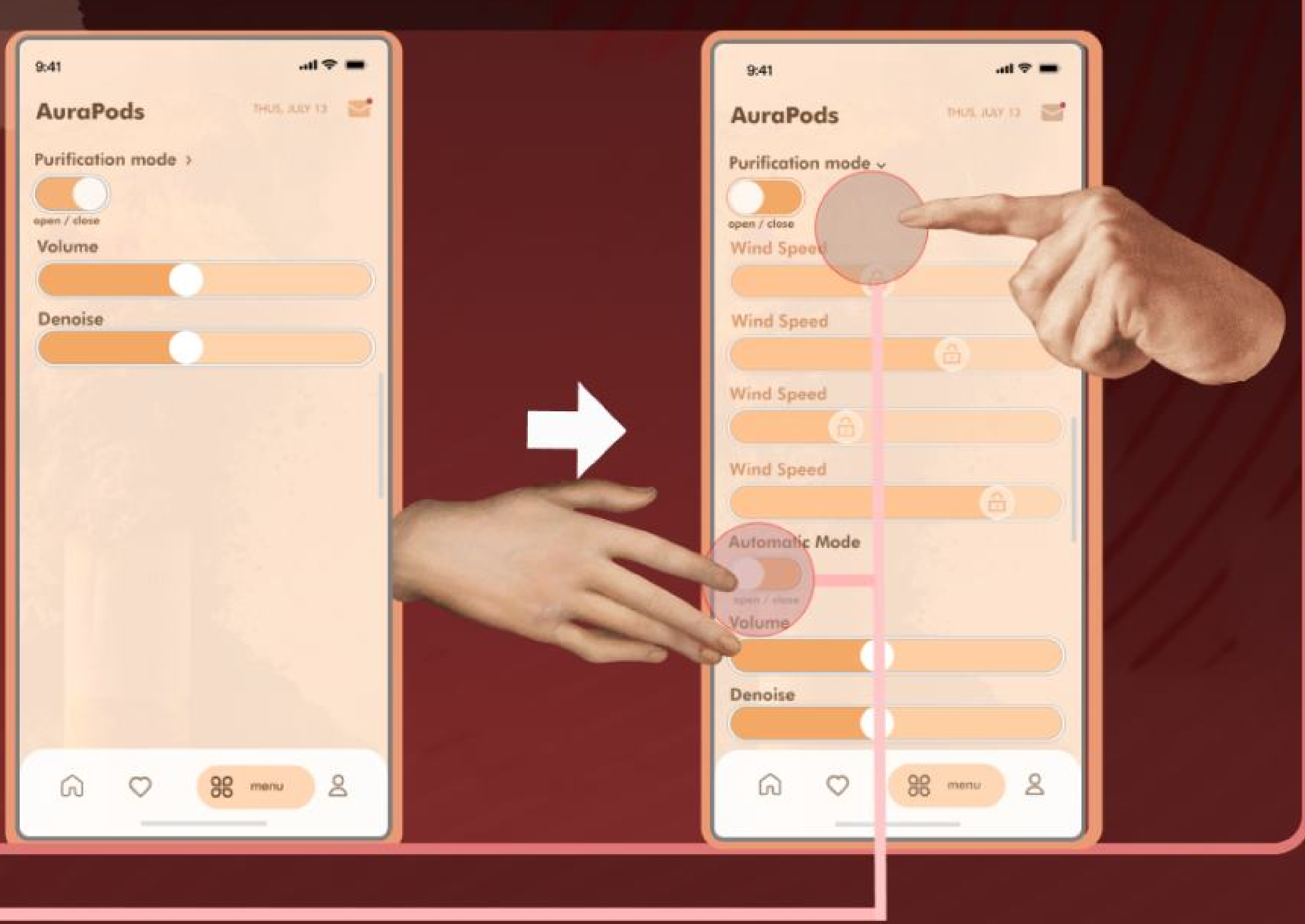
When exposed to second-hand smoke, the system will trigger an alarm. Then, remove the purification tube and put it on. Open the application and activate the **mobile purification mode**.

STEP3-Encountering smoke while eating



When having a meal, if someone is smoking indoors, place the device on the table and switch it to the **space purification mode**.

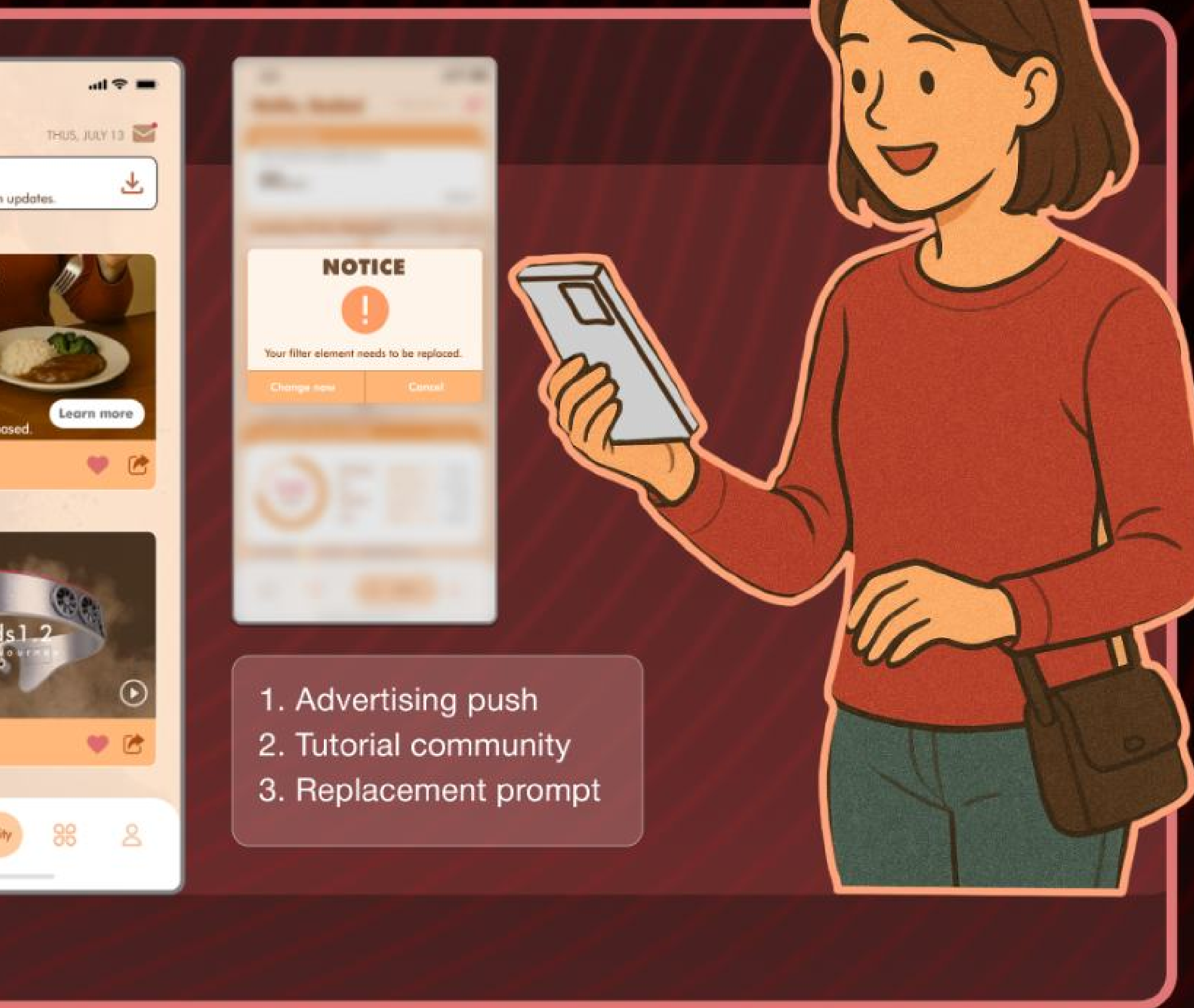
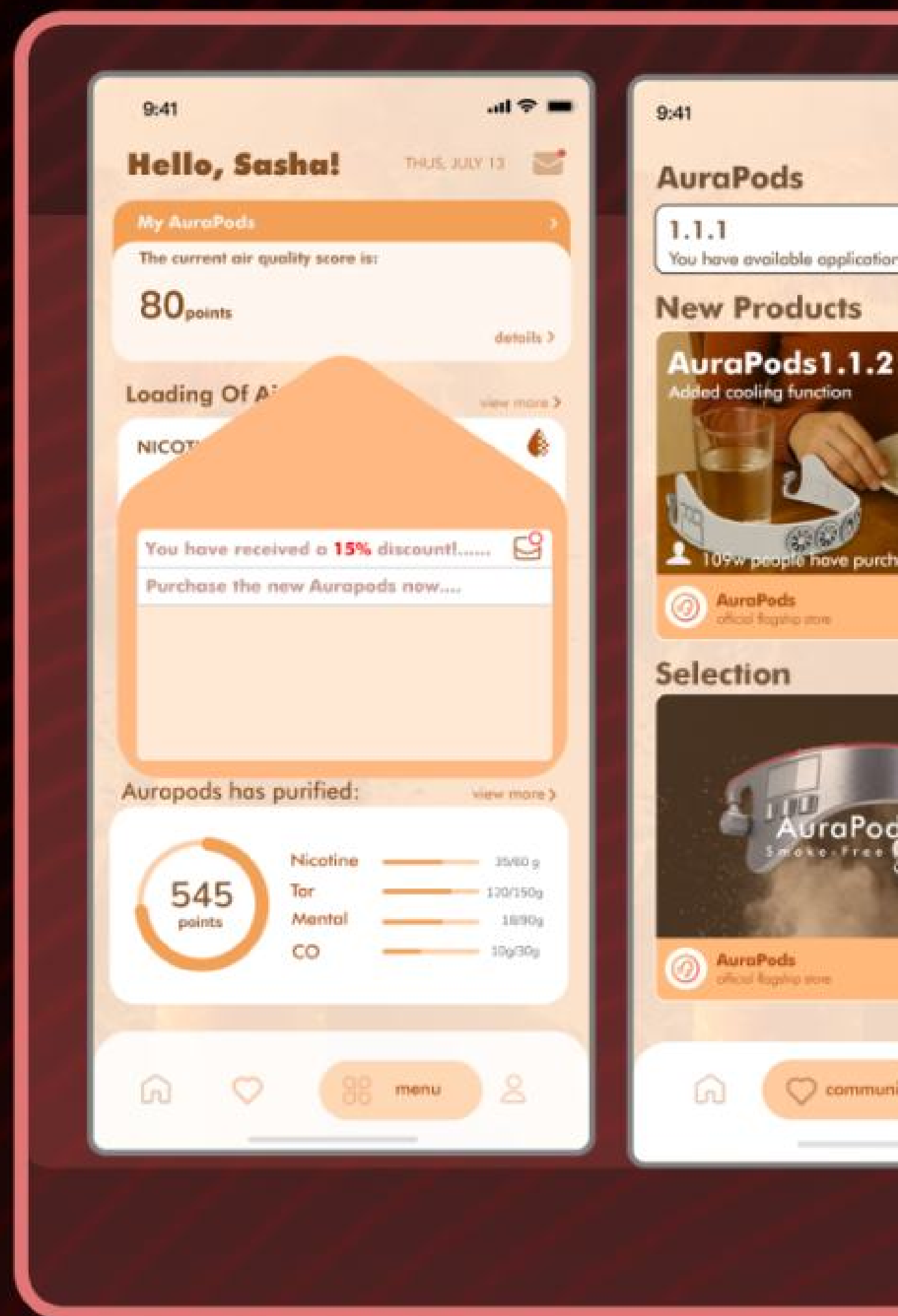
STEP4-Encountering smoke while walking



When the purification mode is activated, the slider for adjusting the purification function parameters will automatically appear.

After activating the automatic mode, the system will adjust the purification parameters on its own according to the real-time pollution conditions.

Other Functions



1. Advertising push
2. Tutorial community
3. Replacement prompt

Visual Design

Color selection



FFB87A FFB87A
FFB87A FFB87A

- Title Content
- Background color tone
- Subheading
- Data output

Font select

Futura

Light/ Medium/Blod

Aa Bb Cc Dd Ee Ff Gg Hh Ii

Aa Bb Cc Dd Ee Ff Gg Hh Ii

Aa Bb Cc Dd Ee Ff Gg Hh Ii

Elements



Setting



Device



Assistant



Bluetooth



Store



Data



Menu



Me

Logo-design



Bluetooth

Bluetooth

Bluetooth