1. Introduction of voice module

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1.1. Introduction to the voice module

1.1.1. CSK4002 chip

The voice control module on ROSMASTER is developed based on the **CSK4002** chip. **CSK4002** is an AISoC with high performance, strong computing power, low power consumption and rich resources developed and designed for the AIoT field. It can be widely used in smart home, smart home appliances, and emerging consumer electronics industries.

- CSK4002 adopts Andes D1088 core, and its AI/DSP acceleration module MVA supports a variety of Neural Network operators and vector operations, and is deeply adapted to iFLYTEK AI algorithms, with a computing power of up to 128GOPS.
- Comes with 8M Flash, 8M PSRAM, 1M SRAM.
- Supports 8 channels of PDM audio input and 16 channels of I2S Audio Input data processing.
- Integrated rich mainstream peripheral interfaces: GPIO/UART/I2C/SPI/QSPI/SDIO/USB1.1/SDIO, etc.
- Equipped with low-latency embedded operating system Free RTOS, complete BSP driver, and complete development tool resources.

1.1.2. module features

- Far-field sound pickup: The front-end adopts iFLYTEK's dual-microphone array algorithm, which can realize 360-degree far-field 5m user pickup. Equipped with automatic vocal gain, which can be adaptively adjusted according to the user's volume to ensure that the overall sound of the audio after noise reduction is consistent.
- Echo cancellation: In the process of user interaction, when the device broadcasts content or music, the user can wake up and interrupt the broadcast process for the next round of interaction, making the interaction experience more natural.
- Voice broadcast: Voice broadcast means that the user wakes up the device and speaks a command word, and the device responds with a corresponding reply broadcast response; or an active prompt. The purpose of the voice broadcast is to give feedback to the user by broadcasting a reply when the user sends a voice command or an appropriate scene.
- Offline command: When the device is awake, the user speaks a command word (instruction) within the specified range. After the voice module receives the information, it performs related processing according to the content of the command word, or transmits the content information to the host computer for related processing.
- Peripheral communication: The module receives the input of the microphone for processing, and then communicates with other devices through USB, I2S, SDIO and other interfaces, and

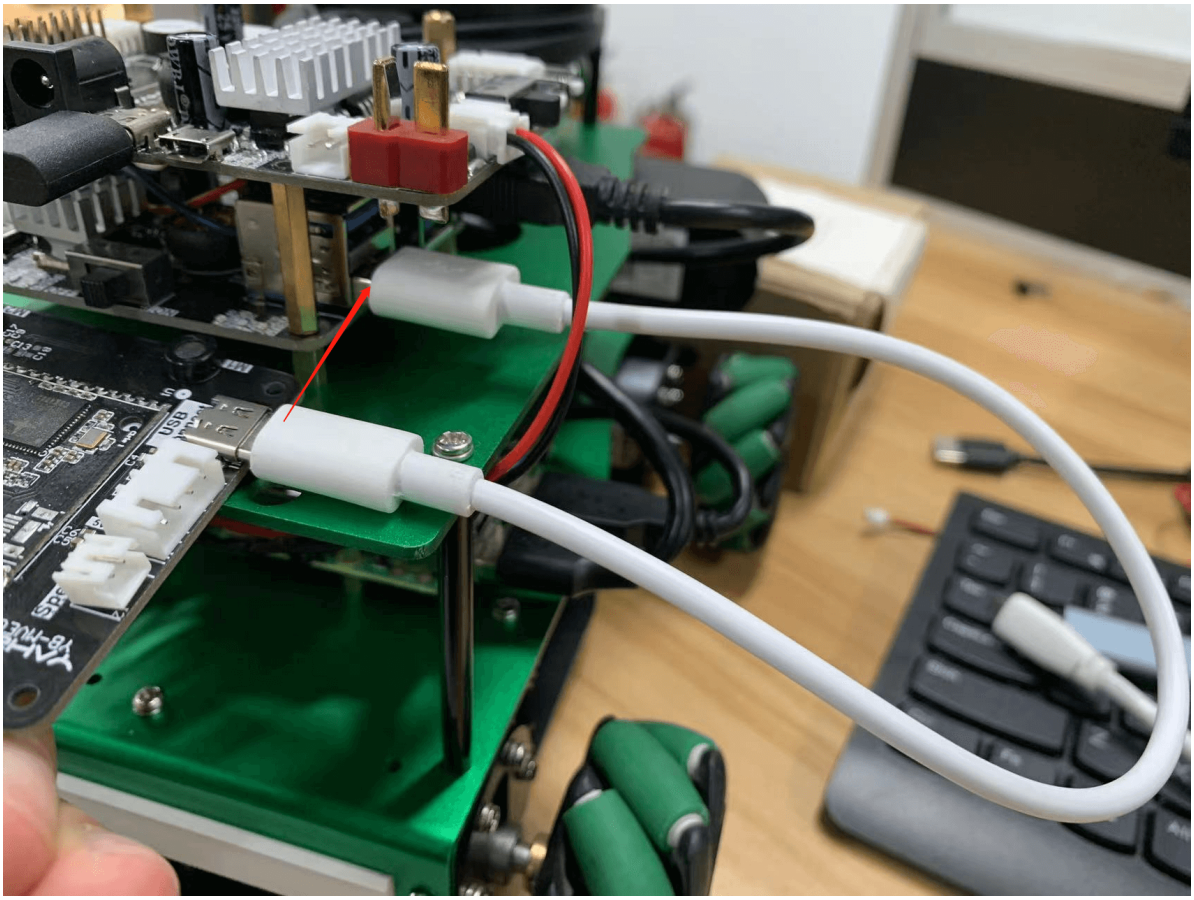
there are also general-purpose programmable IOs to communicate with other devices.
- Environmental noise reduction: It is widely used for environmental noise reduction in home, car, office and other scenes, while reducing noise while retaining human voice information to the greatest extent.

1.2. using the voice module

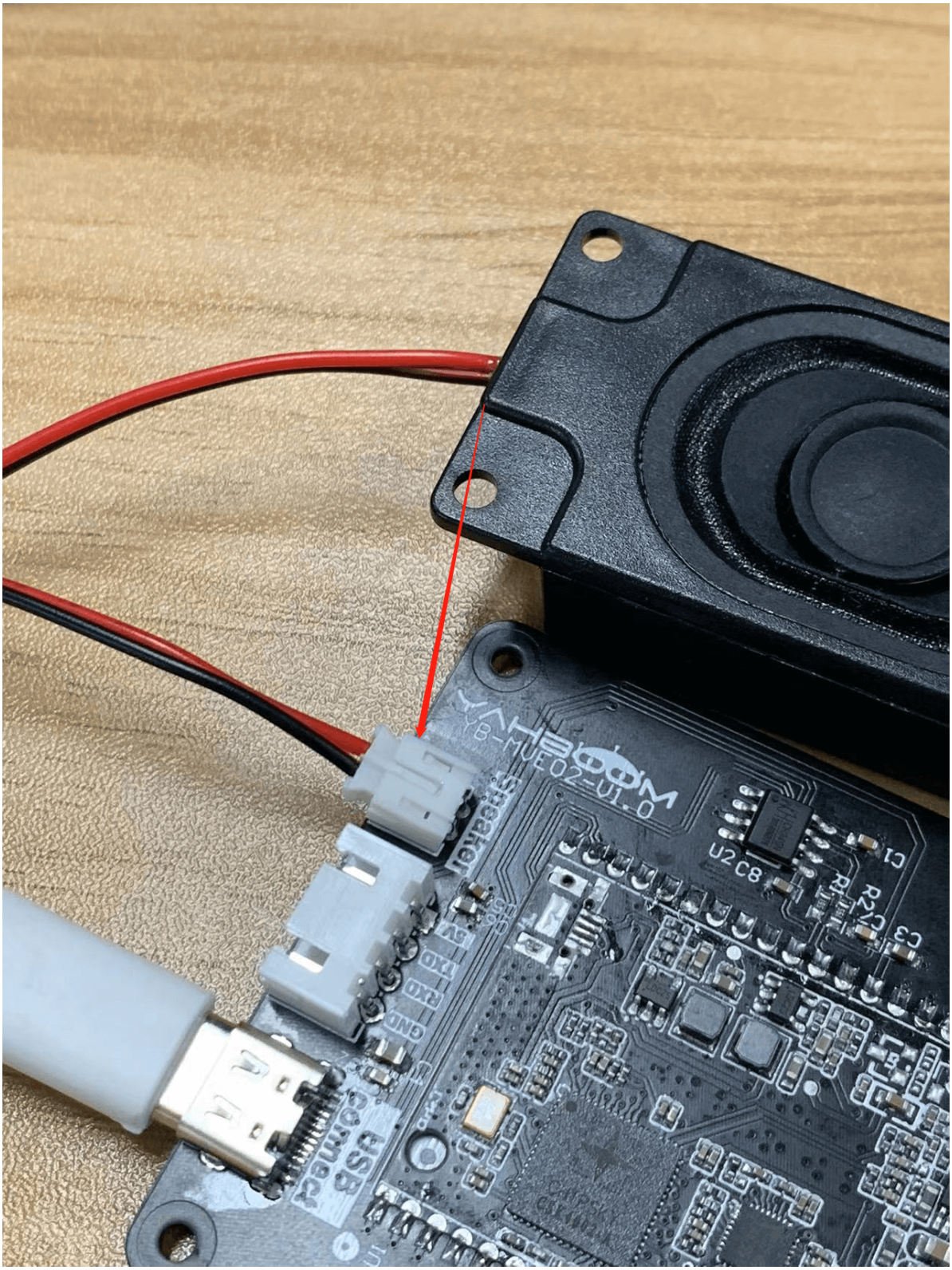
1.2.1. Wiring

The module is connected to the ROSMASTER master (or HUB board) through a universal Type-c data cable, and the speaker and the module are connected through a PH2.0 data cable.

- As shown in the figure below, one end of the Micro-USB data cable is connected to the Program port of the module, and the other end is connected to the port of the ROSMASTER motherboard (**after this is plugged in, it cannot be modified until the rear port is bound.** refer to the next section for details. content).



- As shown in the figure below, the PH2.0 data cable port is connected to the Speaker port on the module.



1.2.2. wake-up word

The wake-up word is "Hi Yahboom". When you wake up, you need to slow down your speech rate. If it is too fast, the module will not recognize it. After the module is woken up, other command words can be recognized later. Within 20 seconds of waking up, you don't need to wake up again, just say the command word directly.

1.2.3. Command words

1.voice control car movement

speech recognition content	The voice module is sent to the host	The host sends to the voice module	Voice broadcast content
Robot stop	$B002#	$A002#	OK , I'm stop.
Go ahead	$B004#	$A004#	OK , let's go.
Back	$B005#	$A005#	OK , I'm back.
Turn left	$B006#	$A006#	OK , I'm turning left.
Turn right	$B007#	$A007#	OK , I'm turning right.
Enter A mode	$B008#	$A008#	OK, I'm working on A mode.
Enter B mode	$B009#	$A009#	OK, I'm working on B mode.

2.voice control RGB light strip effect

speech recognition content	The voice module is sent to the host	The host sends to the voice module	Voice broadcast content
Close light	$B010#	$A010#	OK, light is closed.
Red light up	$B011#	$A011#	OK, red light is on.
Green light up	$B012#	$A012#	OK, green light is on.
Blue light up	$B013#	$A013#	OK, blue light is on.
Yellow light up	$B014#	$A014#	OK, yellow light is on.
light A	$B015#	$A015#	OK, light A is on.
light B	$B016#	$A016#	OK, light B is on.
light C	$B017#	$A017#	OK, light C is on.
Display battery value	$B018#	$A018#	OK, battery value has been display.

3.voice control color recognition

speech recognition content	The voice module is sent to the host	The host sends to the voice module	Voice broadcast content
What color is this?	$B060#	$A061#	This is red
What color is this?	$B060#	$A062#	This is blue
What color is this?	$B060#	$A063#	This is green
What color is this?	$B060#	$A064#	This is yellow

4.voice control color tracking

speech recognition content	The voice module is sent to the host	The host sends to the voice module	Voice broadcast content
yellow following	$B072#	$A072#	OK, I found the yellow
red following	$B073#	$A073#	OK, I found the red
green following	$B074#	$A074#	OK, I found the green
follow this color	$B075#	$A075#	OK, I found this color
stop following	$B076#	$A076#	OK, it has been stoped

5.voice control automatic driving (line patrol)

speech recognition content	The voice module is sent to the host	The host sends to the voice module	Voice broadcast content
Close tracking mode	$B022#	$A022#	OK, tracking mode is closed
Tracking the red line	$B023#	$A023#	OK, I will track the red line
Tracking the green line	$B024#	$A024#	OK, I will track the green line
Tracking the blue line	$B025#	$A025#	OK, I will track the blue line
Tracking the yellow line	$B026#	$A026#	OK, I will track the yellow line

6.voice control multi-point navigation

speech recognition content	The voice module is sent to the host	The host sends to the voice module	Voice broadcast content
Go to the point A	$B019#	$A019#	OK, I'm going to the point A.
Go to the point B	$B020#	$A020#	OK, I'm going to the point B.
Go to the point C	$B021#	$A021#	OK, I'm going to the point C.
Go to the point D	$B022#	$A022#	OK, I'm going to the point D.
Return to the original place	$B023#	$A023#	OK, I'm return back.

7.basic voice control of robotic arm

speech recognition content	he voice module is sent to the host	The host sends to the voice module	Voice broadcast content
Warning	$B038#	$A038#	OK
Lift the arm up	$B039#	$A039#	OK , the arm has been raised
Put the arm down	$B040#	$A040#	OK, the arm is down
Arm left	$B041#	$A041#	OK, the arm has turned left
Arm right	$B042#	$A042#	OK, the arm has turned right
Clamp the clip	$B043#	$A043#	OK, the clip is clamped
Open the clip	$B044#	$A044#	OK, the clip has been opened.

8. control of robotic arm

speech recognition content	he voice module is sent to the host	The host sends to the voice module	Voice broadcast content
Action A	$B045#	$A045#	OK
Action B	$B046#	$A045#	OK
Action C	$B047#	$A045#	OK
Action D	$B048#	$A045#	OK
Reset	$B049#	$A045#	OK
Action E	$B050#	$A045#	OK

9. action of the robotic arm

speech recognition content	he voice module is sent to the host	The host sends to the voice module	Voice broadcast content
Dancing	$B052#	$A052#	OK, Let's dance
Clip the block	$B053#	$A053#	OK,let me clip them

10. robotic arm memory learning

speech recognition content	he voice module is sent to the host	The host sends to the voice module	Voice broadcast content
record it	$B055#	$A055# $A056#	OK, please set the next action. Too many actions, I can't record them
Now is over	$B056#	$A057#	OK,Noted it,I've recorded them.
Display actions	$B057#	$A058#	OK, Let's do it
Clear actions	$B058#	$A059#	OK, actions have been cleared

11. Sort color block

speech recognition content	he voice module is sent to the host	The host sends to the voice module	Voice broadcast content
Sort color block	$B061#	$A065#	It has been in its place
		$A066#	This is yellow
		$A067#	This is green
		$A068#	This is blue
		$A069#	This is red

12. Garbage sorting

speech recognition content	he voice module is sent to the host	The host sends to the voice module	Voice broadcast content
What garbage is this?	$B094#	$A094#	This is a can, which is recyclable
		$A095#	This is an old school bag, which is recyclable
		$A096#	This is a newspaper, which is recyclable
		$A097#	This is a book, which is recyclable
		$A098#	This is a syringe, which is toxic waste
		$A099#	This is a waste battery, which is toxic waste
		$A100#	This is a expired cosmetics, which is toxic waste
		$A101#	This is a expired medicine, which is toxic waste
		$A102#	This is a fish bone, which is wet waste
		$A103#	This is a watermelon rind, which is wet waste
		$A104#	This is a apple core, which is wet waste
		$A105#	This is a egg shells, which is wet waste
		$A106#	This is a disposable chopsticks, which is dry waste
		$A107#	This is a cigarette butt, which is dry waste
		$A108#	This is a peach core, which is dry waste

speech recognition content	he voice module is sent to the host	The host sends to the voice module	Voice broadcast content
		$A109#	This is a toilet paper, which is dry waste