Ziru User Guide v4.31.1034

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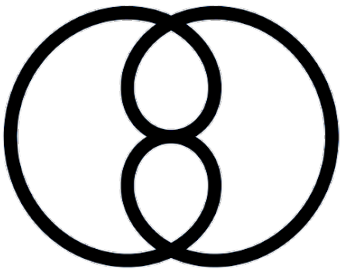

Dodrotu Limited

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1 Health and Safety Warnings

- Anyone who has had a seizure, loss of awareness, or other symptom linked to an epileptic condition should see a doctor before using the headset;
- The headset might distract the user from or partially block the view of actual surroundings. Please remain seated or stationary at all times while wearing the headset;
- Exposure to direct sunlight can damage the headset;
- This product has a number of limitations listed in Product Limitations section below;
- By using this device, you agree that you will not modify or adapt the product.

2 Core Functionality

Ziru is a device that augments user vision. It captures a scene with a camera and projects onto internal displays a view augmented with additional information. This helps the user make better sense of the scene.

Ziru's key controls are software lenses, zoom levels and focus. Just like with hardware lenses, software lenses have properties that make them suitable for a particular occasion, be that reading, watching TV or locating an item in a busy room. Zoom for each lens is controlled independently and allows to alter the framing of the scene and magnify a particular part of it in order to see it better and/or to bring it into focus. Focus is controlled implicitly through zoom: once the object of interest becomes dominant in the scene, Ziru brings it into focus automatically. This essential Ziru functionality—switching between lenses and zooming in and out—is accessible through voice commands *or* key presses.

The rest of Ziru's functionality is accessible through voice commands only. To accommodate a variety of speakers and accents, some actions can be invoked by more than one voice command. When there are alternative commands available they are separated by 'OR'.

Ziru is calibrated with a combination of voice commands and key presses. Calibration needs to be done relatively infrequently, e.g., during device setup, as part of periodic maintenance or if regular adjustments are required, e.g. to keep up with changes in the vision of the user.

The rest of this chapter details commands and key presses that can be used to control Ziru. Voice commands are given in **Bold Title Case**, key presses in *italic*, Ziru's on-screen feedback messages in "DOUBLE-QUOTED ALL CAPITALS", verbal feedback messages in '*Single-quoted Italicised Title Case*', lenses in CAPITALS, and Ziru's states are denoted as StateName=StateValue.

Ziru has three buttons:

- Zoom In;
- Zoom Out;
- Power.

Zoom In and Zoom out are located at the top right, whereas Power button is located at the bottom right.

2.1 Software Lenses

Ziru uses term 'Software Lenses' to refer to what is more commonly known in the field of image processing as 'transforms', 'masks' or 'filters'.

The following software lenses are available in Ziru:

- COLOUR: colour lens designed to reproduce true colours and object proportions and sizes;
- BOOST: composite lens combining COLOUR lens output with OUTLINE lens;
- COGNI: composite lens combining COLOUR lens with a number of other lenses designed to enhance visual cognition;
- GREY: grey scale lens with adaptive brightness and contrast;
- OUTLINE: lens that filters out everything but object outlines;
- INVERT: colour lens that swaps each colour with its opposite on the colour wheel: light areas become dark and dark areas become light, creating a reversed or opposite version of the original image's colours.

Lenses are on a carousel, with

- **Next** - switching to the next lens;
- **Previous** - switching to the previous lens.

It is also possible to switch to the previous lens by *pressing and holding Zoom Out button for 3 seconds*.

Additionally, switching to a specific lens can be done with a single 'jump' command:

- **Activate Colour**;
- **Activate Boost**;
- **Activate Cognition**;
- **Activate Greyscale**;
- **Activate Outline**;
- **Activate Invert**.

2.1.1 OUTLINE Lens

Outline lens is designed to detect object edges and effectively declutter the scene by leaving out everything but object outlines, that are displayed on uniform background.

Outlines in OUTLINE lens are supported in six colours. To change colour of the outlines one can issue:

- **Black Outlines**;
- **Blue Outlines**;
- **Green Outlines**;
- **Red Outlines**;
- **White Outlines**;
- **Yellow Outlines**.

In addition to changing colour of outlines, OUTLINE lens also supports changing background colours using the same six-colour palette.

Background colour could be changed with the following commands:

- **Black Background**;
- **Blue Background**;
- **Green Background**;
- **Red Background**;
- **White Background**;
- **Yellow Background**.

The colour choice will be remembered even if one temporarily switches to another lens.

OUTLINE lens thus has 30 theoretically possible configurations and they span a range of contrast ratios. The table below could be used to look up a pair of colours based on desired contrast ratio:

Table 2: Contrast Ratios for Each Pair of Colours

Colour 1	Colour 2	Contrast Ratio
Black	White	21.00 : 1
Black	Yellow	19.55 : 1
Black	Green	15.30 : 1
Blue	White	8.59 : 1
Blue	Yellow	8.00 : 1
Blue	Green	6.26 : 1
Black	Red	5.25 : 1
Red	White	3.99 : 1
Red	Yellow	3.72 : 1
Green	Red	2.91 : 1
Black	Blue	2.44 : 1
Blue	Red	2.14 : 1
Green	White	1.37 : 1
Green	Yellow	1.27 : 1
White	Yellow	1.07 : 1

Pairs are given in the order of decreasing contrast, and for each pair both variants are possible, e.g., White Outlines on Black Background, or Black Outlines on White Background. Ziru will not mix colours with contrast ratio less than 2.44 to 1, which rules out 8 combinations (last four rows in the above table); she will display "X LOW CONTRAST PAIR" message if such mixture is attempted.

It is possible to swap outline (foreground) and background colours with command:

- **Swap Colours**,

and jump to the pair of colours with the highest contrast with com-

mand:

- **Maximum Contrast Pair**.

By default OUTLINE lens is initialised with maximum contrast pair of white outline on black background, and the above command will return OUTLINE to this original state.

The list of pairs of colours could be traversed in order of increasing or decreasing contrast with commands:

- **Colour Forward**;
- **Colour Back**;

or

- **Colour Forwards**;
- **Colour Backwards**.

or, alternatively,

- **Pair Forward**;
- **Pair Back**.

Additionally, given that a desired outline colour was set, one can switch to background colour that maximises contrast with command:

- **Maximum Contrast Background**.

Similarly, given that a desired background colour was set, one can switch to an outline colour that maximises contrast with command:

- **Maximum Contrast Foreground**.

2.1.2 BOOST Lens

BOOST lens combines COLOUR lens with OUTLINE lens to produce a lens that enhances outlines of objects while preserving original scene

as much as possible.

Outlines in BOOST lens are supported in six colours, just like with OUTLINE lens. To change colour of the outlines one can issue:

- **Black Outlines**;
- **Blue Outlines**;
- **Green Outlines**;
- **Red Outlines**;
- **White Outlines**;
- **Yellow Outlines**.

Because background in BOOST is the original scene, it is not possible to change the colour of background with BOOST like it is possible with OUTLINE lens.

2.1.3 COGNI Lens

COGNI is a composite lens that combines COLOUR lens with another lens, and the choice of this second lens is context- and visual-scene-dependent. COGNI aims to make as few alterations to the original scene as possible while increasing visual cognition.

One example application is reading of text or sheet music—here COGNI improves visual cognition by altering contrast ratio between background and foreground in areas where it matters the most for cognition—around and inside the text. Visual scene overall appears largely unchanged but cognition improves greatly when compared with COLOUR lens. One might consider using COGNI instead of COLOUR lens throughout; however, COGNI is more taxing on battery than COLOUR lens (see benchmark section below) and this should be included into consideration.

It is possible to calibrate the device's frame rate while using the COGNI

lens with:

- **Frame Rate Up**;
- **Frame Rate Down**.

This helps when working in environments with suboptimal sources of light that flicker—if the objects in the scene are largely stationary, the frame rate could be lowered thereby reducing or removing the flicker.

2.2 Zoom

Ziru supports up to 8x magnification, and there are 15 magnification levels: 1x, 1.5x, 2x, 2.5x, 3x, 3.5x, 4x, 4.5x, 5x, 5.5x, 6x, 6.5x, 7x, 7.5x and 8x; one can incrementally switch between them with commands:

- **Zoom In**;
- **Zoom Out**.

Alternatively, *pressing Zoom In key once* increases current magnification level, and *pressing Zoom Out key once* decreases current magnification level.

Jumps to minimum or maximum zoom levels can be performed with commands:

- **Minimum Zoom**;
- **Maximum Zoom**.

Commands that allow to jump to specific zoom level are also available:

- **Zoom One**;
- **Zoom One Point Five**;
- **Zoom Two**;
- **Zoom Two Point Five**;
- **Zoom Three**;
- **Zoom Three Point Five**;

- **Zoom Four**;
- **Zoom Four Point Five**;
- **Zoom Five**;
- **Zoom Five Point Five**;
- **Zoom Six**;
- **Zoom Six Point Five**;
- **Zoom Seven**;
- **Zoom Seven Point Five**;
- **Zoom Eight**.

Default zoom level of 1 (no zoom) can be restored with command:

- **Reset Zoom**.

2.3 Brightness

Ziru supports 10 levels of brightness: 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90% and 100%.

Brightness can be changed incrementally with commands:

- **Brightness Up**;
- **Brightness Down**.

and jump to minimum or maximum brightness can be performed with commands:

- **Minimum Brightness**;
- **Maximum Brightness**.

Commands that allow to jump to specific brightness level are also available:

- **Brightness Ten**;
- **Brightness Twenty**;
- **Brightness Thirty**;

- **Brightness Forty**;
- **Brightness Fifty**;
- **Brightness Sixty**;
- **Brightness Seventy**;
- **Brightness Eighty**;
- **Brightness Ninety**;
- **Brightness One Hundred**.

Brightness is set per lens and defaults to 80%. If brightness is changed to e.g. 60% while in COLOUR lens, the brightness will go up to 80% if one switches to a new lens. Brightness values are remembered between invocations of Ziru, so if one returns to COLOUR lens the brightness will return to previously chosen value of 60%.

Default brightness can be restored with command:

- **Reset Brightness**.

2.4 Volume

Ziru supports 11 volume levels: 0%, 10%, 20%, ..., 90%, 100%.

Volume can be changed incrementally with commands:

- **Volume Up**;
- **Volume Down**.

and jump to minimum or maximum volume can be performed with commands:

- **Minimum Volume** OR **No Volume**.
- **Maximum Volume**.

Commands that allow to jump to specific volume level are also available:

- **Volume Zero**;
- **Volume Ten**;
- **Volume Twenty**;
- **Volume Thirty**;
- **Volume Forty**;
- **Volume Fifty**;
- **Volume Sixty**;
- **Volume Seventy**;
- **Volume Eighty**;
- **Volume Ninety**;
- **Volume One Hundred**.

Volume is set globally and defaults to 80%. Volume level can be reset to this default value with command:

- **Reset Volume**.

2.5 State Inspection and Reporting

The following voice commands can be used to inspect the current values of Ziru's common parameters:

- **Report Battery**;
- **Report Brightness**;
- **Report Frame Rate**;
- **Report Lens**;
- **Report Speech Speed**;
- **Report Volume**;
- **Report Zoom**.

These parameters are commonly adjusted while in View Mode under normal operation of Ziru.

Additionally, current values for the following more technical parame-

ters and constants can be inspected with voice commands:

- **Report Barrel**;
- **Report Left Horizontal**;
- **Report Left Vertical**;
- **Report Right Horizontal**;
- **Report Right Vertical**;
- **Report Scale**;
- **Report Version** (a constant).

These values can be adjusted while in Calibration Mode and are changed rarely, often during initial device adjustment and fitting procedure (with the exception of Version, a constant that cannot be adjusted and only changes when software is upgraded or downgraded).

It is possible to use words ‘show’ or ‘display’ instead of ‘report’ in the above, e.g., **Show Battery** or **Display Battery**.

When inspection command is accepted, Ziru will display the current value on screen as well as verbally (if voice feedback option is switched on).

As battery level is important to keep track of and it inspected frequently, Ziru also responds to the following equivalent battery life inspection commands:

- **Battery**;
- **Battery Life**;
- **Remaining Battery**;
- **Remaining Battery Life**,

etc.

2.6 Flashlight

It is possible to use Ziru in environments where external source of light is insufficient, dimly lit areas where there is no good source of light or if there is a power outage: the device can use built-in light source to illuminate the scene in front of the wearer. Light source can be activated and deactivated with commands:

- **Light On**;
- **Light Off**.

The following commands are also supported and could be used instead:

- **Flashlight On**;
- **Flashlight Off**;
- **Flash On**;
- **Flash Off**.

Flashlight functionality is most useful in indoors environments.

2.7 Text To Speech

Ziru supports optical character recognition (OCR) and text-to-speech (TTS) meaning that she can be instructed to scan a piece of text, decode it, and read out its textual representation with the following command:

- **Read Text**.

When this command is uttered the process of capturing a picture is initialised, the camera flash is fired and the label "LOADING TEXT" is displayed. Once picture has been taken and text processed, Ziru will start reading out loud the text via the device's speakers.

Voice commands are disabled throughout the aforementioned steps,

however the user can interrupt the reading process at any moment by pressing and holding **Zoom In** for 3 seconds—label "TEXT INTERRUPTED" is displayed after this. Finally, on finishing dictation, the label "TEXT FINISHED" will be displayed and the device will return to normal operation.

There are five speeds of speech that are supported: Normal, Fast, Very Fast, Slow and Very Slow. Speed of speech can be adjusted with the following commands:

- **Set Normal Speech**;
- **Set Fast Speech**;
- **Set Very Fast Speech**;
- **Set Slow Speech**;
- **Set Very Slow Speech**.

Instead of 'speech' in the above commands 'reading' could be used, as in, e.g., **Set Fast Reading**. Default speech speed can be restored with command:

- **Reset Speech Speed**;
- **Reset Speech Rate**.

To make the most of Ziru's OCR:

- Use printed, regular and legible fonts that have high contrast in relation to its background. For example, printed letters, book pages, newspaper blocks, etc. It is not effective on hand-written text;
- Make sure you are focusing the block of text you want to be read out and keep your head as straight as possible. If the text is too skewed, Ziru might fail to recognise it;
- Make sure that the block of text you want to be read out is as isolated as possible, otherwise Ziru might capture and read surrounding text as well.

2.8 Text and Voice Feedback

When Ziru receives and executes a command, she can give feedback in two ways:

- on-screen feedback through a text message;
- voice feedback.

For example, the voice command **Activate Cognition** will switch to the COGNI lens if it is not already active (or remain in COGNI if it is). Once the operation is complete, Ziru will display the text message "COGNI" on-screen and also confirm verbally by saying '*Cognition Lens*'.

Voice feedback can be switched on and off using the following voice commands:

- **Voice Feedback On**;
- **Voice Feedback Off**;
- **Turn Voice Feedback On**;
- **Turn Voice Feedback Off**.

2.9 Known Issues

2.9.1 Out-of-focus State

The focus algorithms very infrequently get stuck in an out-of-focus state. This is a known hardware limitation that affects Ziru King Dragon and Ziru Glass Dragon models and cannot be fixed at software level. If your device is out-of-focus it could be reset by turning the device on and off using the Power button.

3 Use Cases and Benchmarks

- If user is in an environment where it is inconvenient or inappropriate to use voice to command Ziru, user can change lenses or zoom level silently using buttons only;
- To watch a film or TV program while ensuring Ziru won't erroneously accept a command from a third party (e.g. through accidental match) one could switch Ziru to Voice Recognition=Off;
- To prolong battery life one can decrease brightness, switch to a less complex or more efficient lens and disable voice recognition; here are some example timings that can be used as a guide, starting from 100% battery at hour 0 for Ziru Augmented Vision version 1.0.269, with Voice Recognition=Enabled, as a function of lens:

Table 3: Battery Remaining and Total Runtime for Each Lens

Brightness	Lens	Hour 1	Hour 2	Hour 3	Hour 4	Total Runtime
80%	COLOUR	78%	53%	25%	2%	4 hours
80%	GREY	77%	52%	26%	5%	over 3.5 hours
80%	OUTLINE	76%	52%	25%	5%	over 3.5 hours
80%	BOOST	75%	49%	18%	-	3.5 hours
80%	COGNI	71%	40%	8%	-	over 3 hours

Screen brightness affects battery life to a lesser extent; as a function of brightness, using COLOUR lens, with Voice Recognition=Enabled:

Table 4: Battery Remaining and Total Runtime for Each Brightness

Brightness	Lens	Hour 1	Hour 2	Hour 3	Hour 4	Total Runtime
100%	COLOUR	77%	52%	26%	-	over 3.5 hours

Brightness	Lens	Hour 1	Hour 2	Hour 3	Hour 4	Total Runtime
80%	COLOUR	78%	53%	25%	2%	4 hours
60%	COLOUR	78%	55%	27%	3%	4 hours
50%	COLOUR	78%	56%	32%	5%	over 4 hours
30%	COLOUR	79%	57%	34%	10%	over 4 hours

Using COLOUR lens at 80% brightness with and without Voice Recognition:

Table 5: Battery Remaining and Total Runtime for Each Voice Recognition State

Voice Recognition	Hour 1	Hour 2	Hour 3	Hour 4	Total Runtime
Enabled	78%	53%	25%	2%	4 hours
Disabled	79%	59%	36%	16%	4.5 hours

Tests were conducted on different but typical indoors scenes, with medium number of objects in each, and with battery at the beginning of its life cycle. INVERT lens was not benchmarked, but we expect the performance to be similar to COLOUR lens.

4 Device Calibration

Calibration Mode can be entered and exited with the following commands:

- **Enter Calibration** OR **Calibrate View**;
- **Exit Calibration** OR **Reset View**.

When Calibration Mode is successfully entered, Ziru confirms with '*Calibration Mode*' verbal feedback and adds green tint. When Cali-

bration Mode is successfully exited, Ziru confirms with '*View Mode*' verbal feedback and green tint is removed.

All report commands listed in State Inspection and Reporting section continue to work while in Calibration Mode.

In Calibration Mode values for some parameters can be altered with zoom buttons. The way to make changes follows the pattern:

- select value that needs changing with selection command;
- increase or decrease the value with zoom buttons;
- inspect current value of the parameter with report command (optional).

Supported selection commands are discussed in the following sections.

4.1 Positions of Projections

Position of projection for each eye is controlled via two offsets: horizontal and vertical.

While in Calibration Mode one can issue the following voice commands:

- **Select Left Horizontal**;
- **Select Left Vertical**;
- **Select Right Horizontal**;
- **Select Right Vertical**,

to select eye and direction and then use *Zoom In* and *Zoom Out* buttons to move each projection.

Red circle is displayed for the eye that was selected, and inside the circle a horizontal or vertical red bar is displayed indicating the direction of movement.

4.2 Projection Sizes

Projection size is adjusted for both eyes simultaneously. To perform the adjustment, first rescale view setting needs to be selected via the following command:

- **Select Scale**,

and then one can use *Zoom In* and *Zoom Out* buttons to adjust the projection size.

4.3 Barrel Power

Barrel Power is adjusted for both eyes simultaneously. To perform the adjustment, first Barrel Power setting needs to be selected via the following command:

- **Select Barrel**,

and then one can use *Zoom In* and *Zoom Out* buttons to adjust the Barrel Bower.

4.4 On-screen Feedback Alignment

On-screen feedback text could appear centred, left- or right-aligned. While in calibration mode, on-screen feedback alignment could be altered via the following commands:

- **Text Centre**;
- **Text Right**;
- **Text Left**.

By default feedback text is displayed centred. For users with central vision loss switching to left- or right-aligned on-screen feedback messages could improve their visual comprehension.

4.5 Calibration Reset

Position of projection for each eye is controlled via two offsets: horizontal and vertical. Both offsets can be returned to default values for each eye independently via commands:

- **Reset Left**;
- **Reset Right**.

We do not support resets of horizontal and vertical offsets separately, for simplicity of the interface. If one of them needs to be reset, one can make note of the other offset that needs to be kept, reset both and adjust the other offset to the value noted.

Values for scale and barrel can be reset with commands:

- **Reset Scale**;
- **Reset Barrel**,

respectively.

All values could be returned to their factory settings by issuing the following voice command while in Calibration Mode:

- **Reset Calibration**.

The receipt of this command is acknowledged with voice feedback '*All Values Reset to Defaults*'.

5 Maintenance and Cleaning

Over time, dust and microdebris can accumulate on display surfaces and lenses. Each eyepiece can be unscrewed, providing access to both the display surface and the inner side of the eyepiece lens. To clean these surfaces, gently wipe them with a microfiber cloth.

To determine which side needs cleaning, close one eye and then the other while wearing Ziru. If the debris disappears when one eye is closed, that indicates the side requiring cleaning.

Once the side is identified, you can determine whether the debris is on the lens or the display by rotating the eyepiece while looking through it. If the debris moves, it is on the inner surface of the lens; if it remains stationary, it is on the display surface.

While a family member or support group can assist with cleaning, a certain level of skill and a microfiber cloth are required. If you prefer professional cleaning, please contact Dodrotu support. If Dodrotu handles the cleaning, we can also inspect for wear and tear and update Ziru AV software to the latest version.

6 Notable State Machines

This section outlines a subset of state machines of Ziru AV that support multiple states, have relatively non-trivial transitions between them or happen to possess some other kind of complexity.

Simple on/off states such as Flashlight=On and Flashlight=Off are not included here.

Some states are mutually exclusive (e.g., Flashlight=On and Flashlight=Off), whereas others are occupied simultaneously (e.g., Flashlight=On and Battery=Charged). Where appropriate, we use this section to also describe interesting interactions between states.

6.1 Operation States

6.1.1 Description

Each Operation State has different use:

- On: Ziru is analysing video scene, listening to voice commands and monitoring movement sensors;
- Standby: Ziru has entered light power-saving mode due to no user activity but she is monitoring movement sensors;
- Sleep: Ziru is in deep power-saving mode: she is not doing audio or video processing and not monitoring movement sensors;
- Off: Ziru is powered down.

Each Operation State has different energy consumption; starting from fully charged state:

- On: battery lasts 3-4 hours, depending on the lens complexity and brightness setting;
- Standby: battery lasts approximately 24 hours;
- Sleep: battery lasts over a week;
- Off: indefinitely.

6.1.2 Transitions

6.1.2.1 Normal Operation

- Off → On : press and hold power button for 5 seconds; takes 5 seconds;
- On → Sleep : press power button once; transition is instant;
- On → Standby : no physical movement for 5 minutes; takes 5 minutes;
- Standby → On : any physical movement; transition is instant;

- Sleep → On : press power button once; transition is instant;
- Sleep → Off : through eventual battery discharge if not attached to power source; transition takes over a week.
- On → Off,Battery=Discharged : through use under normal operation.

6.1.2.2 Standby State Standby state is entered whenever Ziru is left unattended in On state for more than five minutes. In this state video and audio processing are stopped and the screen is black. Ziru can detect very fine movements and should not enter Standby state while the user is wearing it, and even a very subtle motion will trigger a return to On state.

6.1.2.3 Device Reset If device is on but not responding or in a state where Ziru is not accessible, it can be returned to on state with

- On → Off → On : press and hold zoom out and power button simultaneously for 7 seconds; transition takes 15 seconds.

6.1.2.4 Known Issues

- Off → Sleep : not possible directly, but via On state.
- Operation=On → Operation=Off,Battery=Charged : not possible directly, only by fully discharging the device.

NB: theoretically possible by fully discharging the device and charging without turning on.

6.2 Battery States

6.2.1 Description

Possible states:

- Charged;
- Partially Charged;
- Discharged.

When Power Cable is Attached:

- When in Operation=On state: (1) a spinning circle is shown or there is no feedback (depending on compute hardware installed);
- When in Operation=Sleep,Sound=On state a sound is played and text is shown briefly in the left eye;
- When in Operation=Sleep,Sound=Off state text is shown briefly in the left eye;
- When in Operation=Off,Battery=Discharged there is no feedback;
- When in Operation=Off,Battery={Charged, Partially Charged} there is a spinning circle showing percentage.

NB: if you put Ziru to charge, if it is in Operation=On state it is better to put Ziru into Operation=Sleep state so that it does not continue to operate while charging.

When Power Cable is Detached, a sound is played and battery remaining is reported via on-screen and verbal feedback in the following states:

- When in Operation=On,Sound=On;
- When in Operation=Sleep,Sound=On.

6.2.2 Transitions

When power cable is not attached transitions are:

- Discharged → Charged : attach power cable; takes 100 minutes;
- Partially Charged → Charged : attach power cable; time varies depending on residual charge;
- Charged → Discharged : through use; time depends on Operation State.

If power cable is attached Charged state can be maintained and Ziru can operate indefinitely.

6.2.2.1 As Power Cable is Removed:

- When in Operation=Sleep state Ziru transitions to Operation=On state and is ready for use;
- When in Operation=On there is no feedback;
- When in Operation=Off there is no feedback.

NB: If you were charging Ziru and are disconnecting it but do not plan to use it immediately, check that Ziru's displays are off:

- if displays are on, press Power button once to transition Ziru into Sleep state. Otherwise Ziru will continue to operate and deplete charge within three hours.
- if displays are off, Ziru was charging in Off state and there is no need to turn it on. If you pressed the Power button, it is necessary to wait for Ziru to complete boot process; once Ziru is in Operation=On state, press Power button once to transition it into Sleep.

6.2.2.2 As the Battery Discharges:

- when battery falls to 15% a system popup is displayed;

- when battery falls to 5% a system popup is displayed and screen is dimmed. Shortly after that Ziru will shut down.

NB: Once battery level falls to 15% we recommend putting Ziru to charge and charge it to 85% or more. This will increase battery life span and health.

6.3 Sound States

6.3.1 Description

Ziru optionally plays a notification sound when:

- Power button is pressed and Ziru enters Sleep state (Operation=On → Operation=Sleep) [Sound A];
- Power button is pressed and Ziru leaves Sleep state (Operation=Sleep → Operation=On) [Sound B];
- Charger is connected while Ziru is in On or Sleep state [Sound C];
- Charger is disconnected while in On or Sleep state [Sound D].

NB: Ziru will transition from Operation=Sleep state to Operation=On state if power cable is disconnected, and so she may play either Sound B or Sound D to notify the user.

6.3.2 Transitions

- On → Off: issue **Volume Down** voice command until 0% volume is reached;
- Off → On: issue **Volume Up** command until desired volume level is reached.

6.4 Voice Recognition States

6.4.1 Description

- Enabled: Ziru listens and responds to voice instructions;
- Disabled: Ziru does not react to voice instructions.

6.4.2 Transitions

- Enabled → Disabled: *press and hold Zoom In button for 7 seconds*;
- Disabled → Enabled: *press and hold Zoom In button for 7 seconds.*

6.5 Voice Feedback States

6.5.1 Description

- On: Ziru confirms completion of operations verbally and with on-screen text message;
- Off: Ziru confirms completion of operations with on-screen text message only.

6.5.2 Transitions

- On → Off: issue **Voice Feedback Off**;
- Off → On: issue **Voice Feedback On**.

6.6 Calibration Mode States

6.6.1 Description

- View Mode: Ziru is analysing the video scene, responding to View Mode voice commands, and monitoring movement sensors.

- Calibration Mode: Ziru is applying a green tint and responding to Calibration Mode voice commands.

6.6.2 Transitions

- View Mode → Calibration Mode: issue **Enter Calibration**;
- Calibration Mode → View Mode: issue **Exit Calibration**.

7 Product Limitations

- Ziru accepts the majority of its commands exclusively by voice, with only the most frequently used functions being also available to control via physical buttons. Ziru's user thus (1) needs to be able to utter the commands and (2) have access to an environment with a relatively low background noise. Even when both of these conditions are met, the recognition success may depend on the stress, voice timbre, intonation and command complexity. It may be necessary to repeat the command or choose an alternative command that has a higher success rate for that user;
- Ziru reduces field of view and presently can only be used while stationary or seated in order to avoid the danger of falling;
- Ziru by default comes with a magnetic charger cable. If you are using a cochlear implant, heart monitor, pacemaker, continuous glucose monitor or another implantable medical device please consult your doctor or the manufacturer of your medical device. Please contact us if you would prefer a device without a magnetic charger cable;
- This version of Ziru is not connected to the Internet or any other network. Dodrotu will optionally collect feedback via email or phone survey only;
- Ziru should be calibrated for each individual user by adjusting

lens positions to match their interpupillary distance. We can configure Ziru before shipping if the interpupillary distance is known at the time of purchase. Alternatively, the device could be configured by the user's optician, the user's family member or the user themselves if their condition allows them to learn the calibration process, press the buttons on the device and read and follow instructions in the manual. The calibration is not complex and involves a combination of voice commands and button presses. Calibration operations are detailed in the Calibration section of this guide;

- Ziru is not waterproof. While light rain will not cause it damage if the exposure is brief (e.g., while attending a live sports event outdoors the rain has started, but the unit was put away and was thoroughly dried afterwards), prolonged exposure to rain may result in damage to the unit. We do not recommend using Ziru in the rain. Washing the unit is not possible either, but the headwear can be cleaned with a cloth dampened in warm water and a minimal amount of gentle detergent. Lenses need to be regularly wiped with dry microfiber cloth.

8 Li-Ion Battery

Ziru contains Li-Ion battery.

8.1 Transporting Ziru

When transporting your Ziru, ensure it is securely positioned to prevent movement that could lead to damage. It is important to keep the product away from extreme temperatures. Avoid leaving the product in places like a car's trunk or under direct sunlight, where temperatures can significantly fluctuate. Instead, opt for a climate-controlled

environment where the temperature is maintained between 10°C and 25°C (50°F and 77°F).

8.2 Storing Ziru

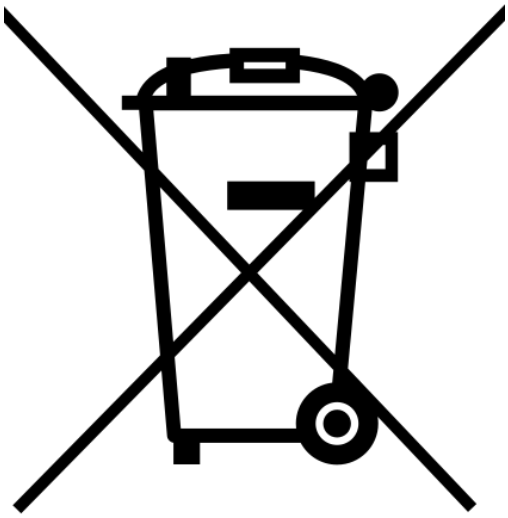
For storage, select a dry, cool place away from moisture or direct heat sources. If the product will not be used for an extended period, store the battery with a charge level around 50%. This practice helps maintain battery health. A fully discharged battery might lose its ability to recharge, while an overcharged battery could degrade faster. Ensure that the storage area is free from potential hazards like sharp objects or heavy weights that could press against or puncture the battery.

8.3 Travel Considerations with Ziru

If you plan to travel with Ziru, especially by air, check with your airline for specific regulations regarding Li-Ion batteries. Airlines often have strict guidelines for carrying devices with such batteries due to safety concerns. Always have this User Guide at hand for reference and abide by the airline's instructions to ensure a safe and compliant travel experience.

8.4 Disposal of Ziru

Ziru must be disposed of properly at the end of Ziru's lifespan. Improper disposal can lead to environmental harm and potential safety risks. At the end of your product's lifespan, do not dispose of it as regular household waste. Instead, contact us to arrange collection so that we can dispose it for you, or, alternatively, consult local regulations or recycling programs for safe and eco-friendly disposal methods.



9 Dedication

Dedicated to the memory of Dr Tetyana Bogdan (1979–2025), founder of Dodrotu and designer of Ziru's headwear attachment.