CREATOR'S BOOKLET

CircuitMess

Meet Wheelson

Wheelson is a small DIY self-driving car that uses electromotors and microcomputers to autonomously navigate while driving.

How does it work?

- Assemble your own autonomous vehicle
- Enable autonomous driving mode
- Take it for a test drive
- Code your own program for Wheelson

What is CircuitMess?

CircuitMess started in 2016 when Albert (our CEO) was 17.

Albert loved tinkering with electronics, and one of his first projects was a DIY game console.

People liked the idea, so he launched it on **Kickstarter**, which raised $100,745!

After that, CircuitMess was born. We are a small and fast–growing team of tech lovers who wish to share our love of creating new technology with the rest of the world!

Albert

The mission

Everybody knows how important technology is, but less than 1% of the population knows **HOW TO MAKE** new technology.

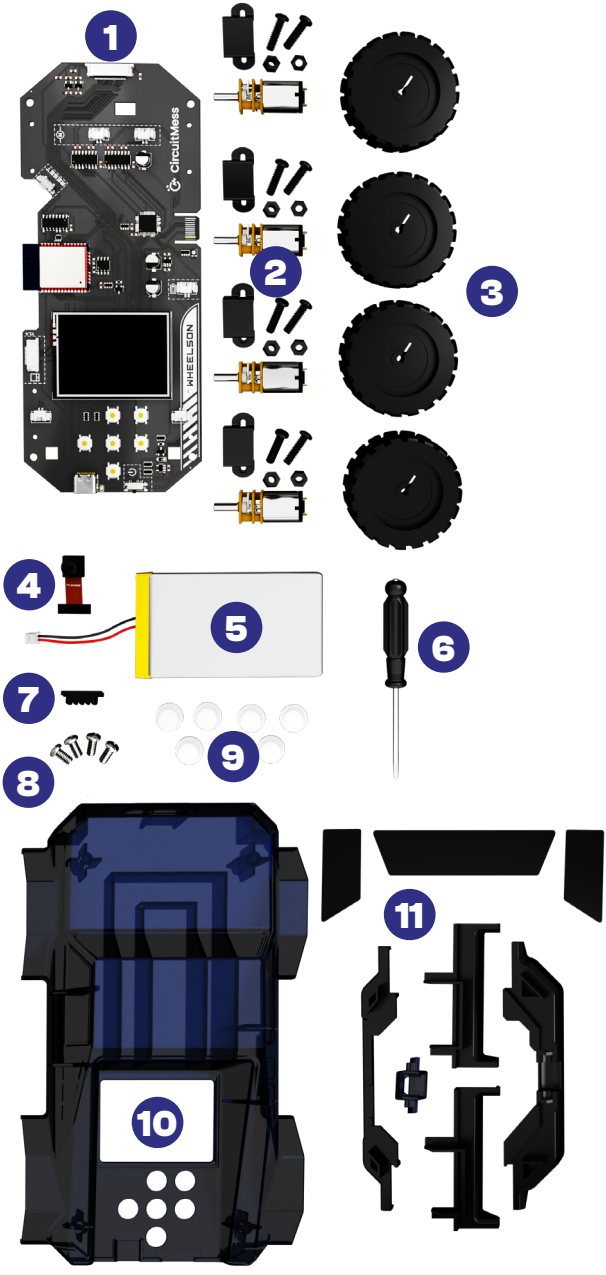
We're here to change that! With our kits, we want to inspire people to be **CREATORS** instead of just consumers.

What will you learn?

- How to assemble a small 4-wheeled robot
- How to control an electromotor using a microcomputer
- How computer vision works
- How to calibrate your robot's camera
- How autonomous cars work and how to make your car navigate a road autonomously
- How to recognize and scan a QR code using your robot's camera
- How to recognize different simple objects using a camera and image processing algorithms

What's inside the box?

1.  Main circuit board
2.  Motors and screws
3.  Wheels
4.  Camera
5.  Li-Po battery
6.  Screwdriver
7.  Plastic on-off cap
8.  Screws
9.  Button caps
10.  Main shell casing
11.  Stickers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A brief history of autonomous cars

1939

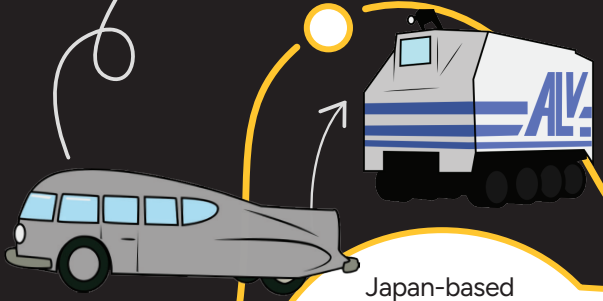
1

American futurist Norman Bel Geddes exhibited a concept of a self-driving car. It was an electric vehicle guided by radio-controlled electromagnetic fields in the roadway.

2021

5

CircuitMess created Wheelson - an educational autonomous car



1977

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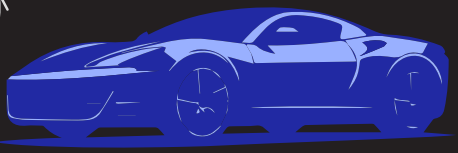
Japan-based Tsukuba Mechanical produced an autonomous passenger vehicle with a camera system that could recognize street markings while travelling at 20 mph



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Tesla's Model 3 has become the world's all-time best selling plug-in electric car, with more than 800,000 vehicles delivered through December 2020.

2020

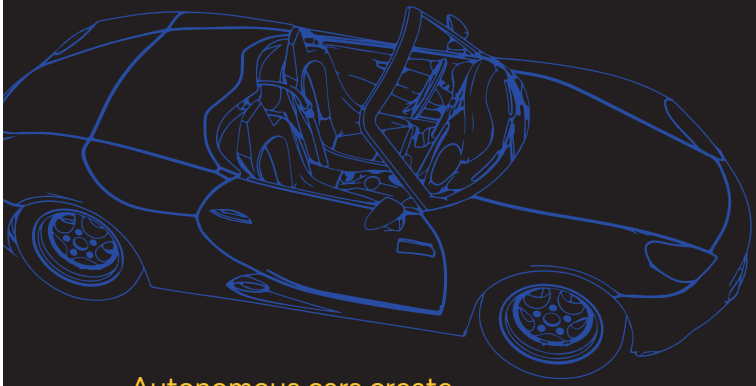
Organizations across the world invest heavily in research and development of electric vehicles and self-driving technologies.

3

1980–2000

How do autonomous cars work?

Autonomous cars rely on sensors, actuators, complex algorithms, machine learning systems, and poweful processors to execute software.



Autonomous cars create and maintain a map of their surroundings based on a variety of sensors situated in different parts of the vehicle.

Radar sensors monitor the position of nearby vehicles.

Video cameras detect **traffic lights**, read **road signs**, track other **vehicles**, and look for **pedestrians**.

Lidar (light detection and ranging) sensors bounce pulses of light off the car's surroundings to measure distances, detect road edges, and identify lane markings.

Ultrasonic sensors detect curbs and other vehicles when parking.

Sophisticated software then processes all the sensory input, plots a path, and sends instructions to the car's actuators, which control acceleration, braking, and steering.

Hard-coded rules, obstacle avoidance algorithms, predictive modeling, and object recognition help the software follow traffic rules and navigate obstacles.

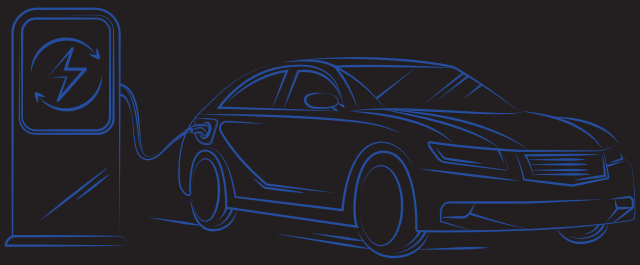
Wheelson has a single **video camera** that is used for autonomous driving.

The signal from the camera is processed by the microprocessor on its main board.

This process is also know as **computer vision** - which is basically a process where a computer needs to use an algorithm to determine a certain action depending on the video feed from a camera.

Where does Wheelson get its power from?

Though it may be small, Wheelson is a real electric car.



Electric cars charge by **plugging into a charge point and taking electricity from the grid.**

They store electricity in rechargeable batteries that power an electric motor, which turns the wheels.

Electric cars accelerate faster than vehicles with traditional engines - so they feel lighter to drive.

Wheelson has a single-cell rechargeable **Li-Po battery**.

Li-Po stands for lithium polymer battery which describes the composition of the battery.

These batteries are one of the most widely used ones nowadays and can be found in your phone, laptop, smartwatch, etc.

FUN FACT - How do autonomous cars see in the dark?

Computer vision-enabled low-light mode

In order to process low-light images and videos, self-driving vehicles use different algorithms than the ones used for daylight.

The images captures in low light may be blurry and such data may not be accurate enough for autonomous driving.

As soon as a computer vision algorithm detects low-light conditions, it can shift to low-light mode.

Autonomous cars navigate in low-light conditions using Lidar sensors, thermal cameras, and HDR sensors. These types of equipment can be used to create high-quality images and videos in low-light environments.

Safety first

Before you start with the assembly, pay attention to the following safety measures:

1. Handling a screwdriver is not recommended for children under the age of 7!

2. **Keep Wheelson away from young children! This product contains small components that are dangerous to children under the age of 3.**

3. If you are a minor, assemble Wheelson strictly with the help of an adult.

Wheelson is not a toy for toddlers.

Closely follow all the instructions you received in this kit and those found on our online pages so that no one gets hurt.

If you have never used a screwdriver, carefully follow the assembly instructions on our website and, if necessary, ask someone more experienced or older than you to help you.

If you are having problems with our kit, contact our customer support via email at contact@circuitmess.com.

Build guide

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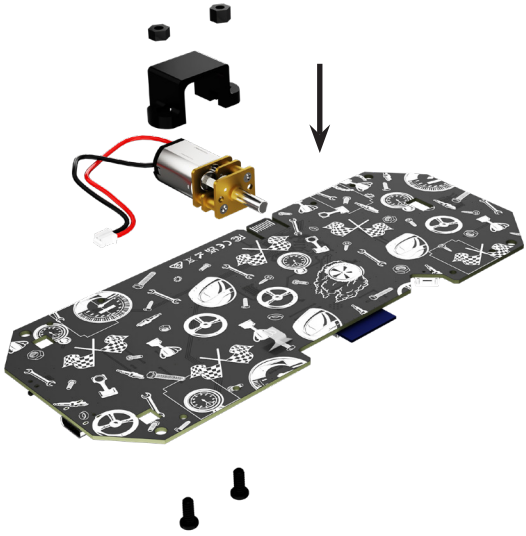

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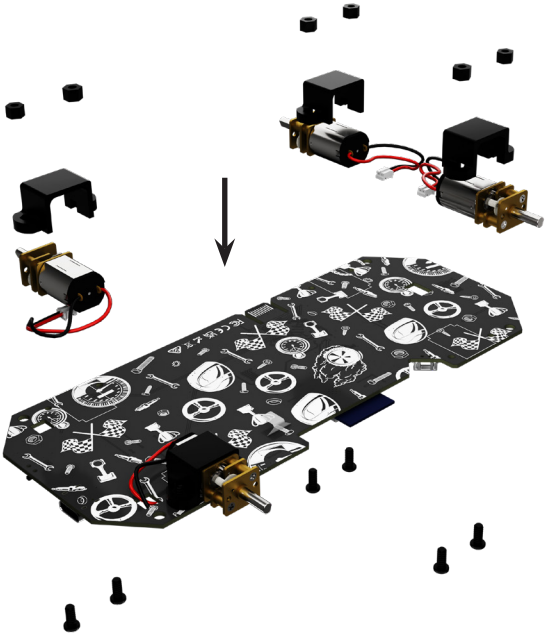

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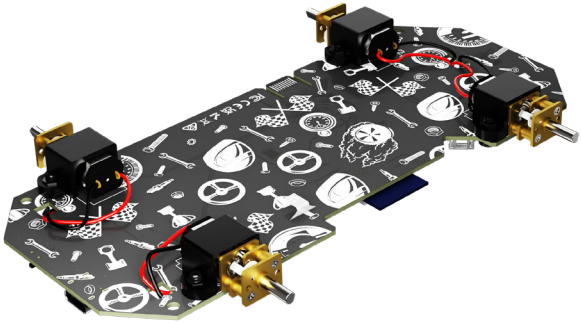

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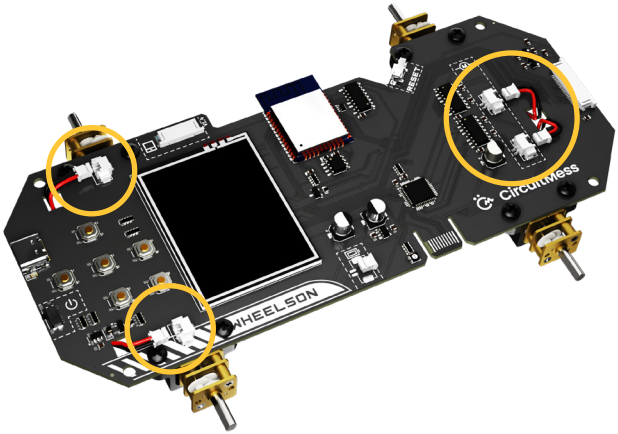

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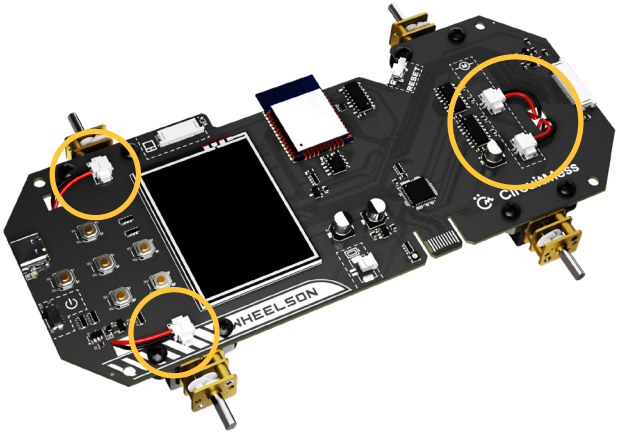

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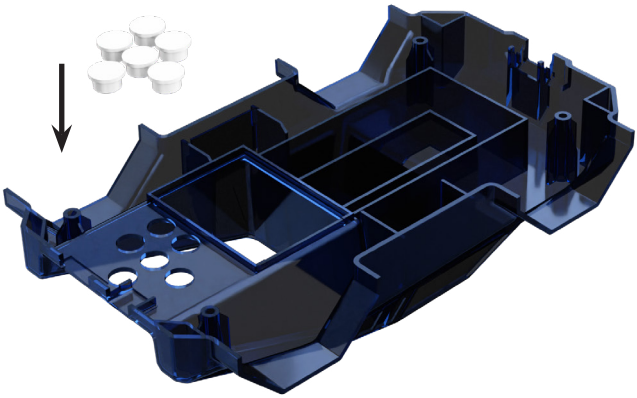

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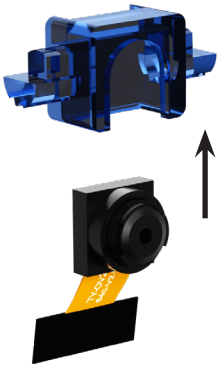

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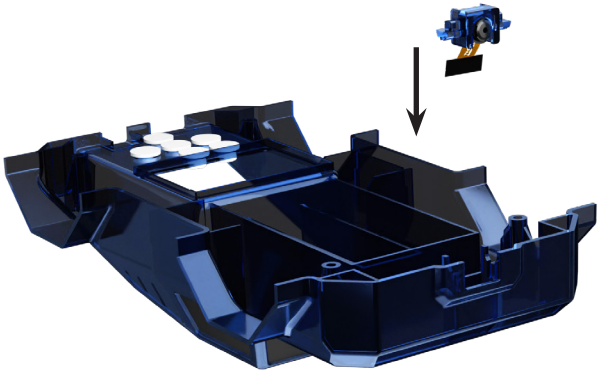

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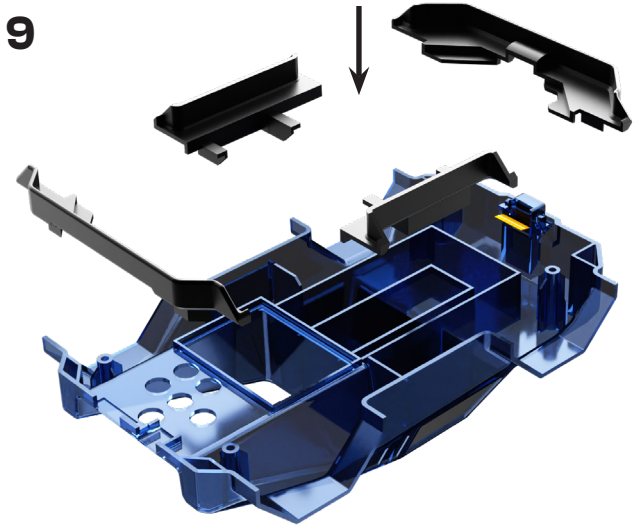

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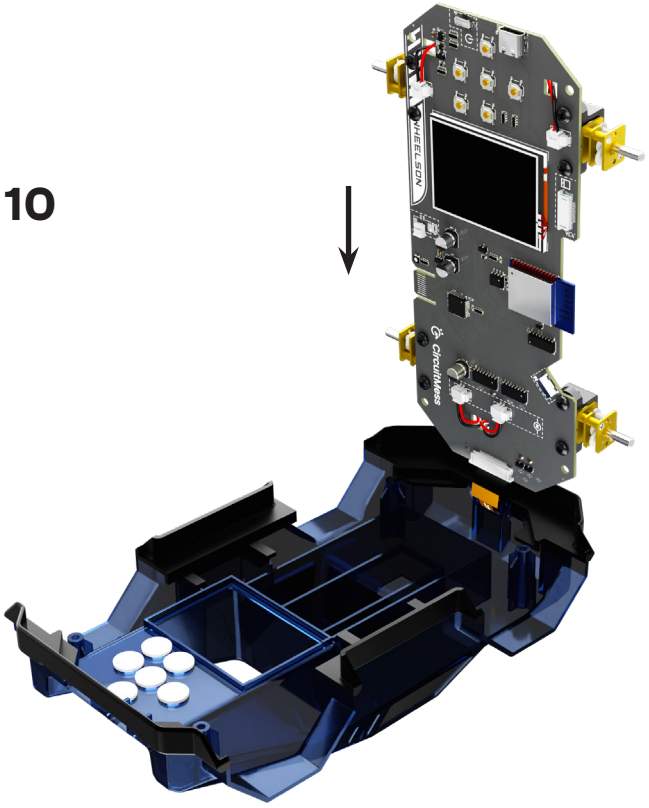

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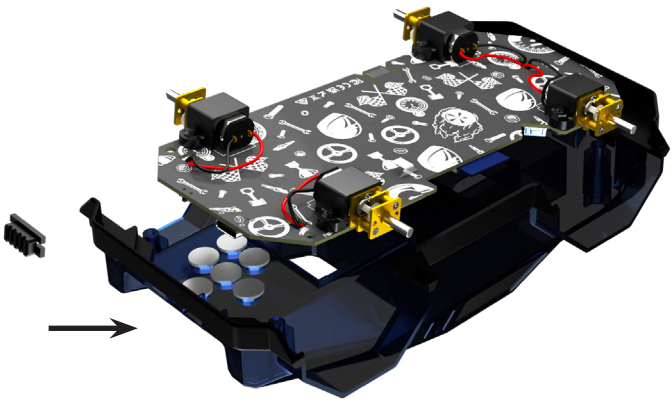

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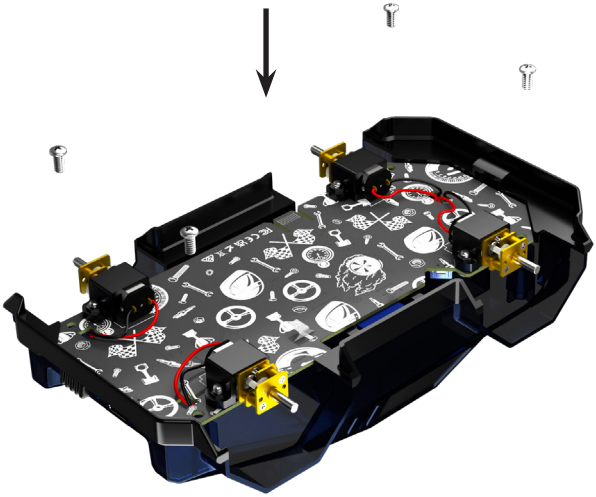

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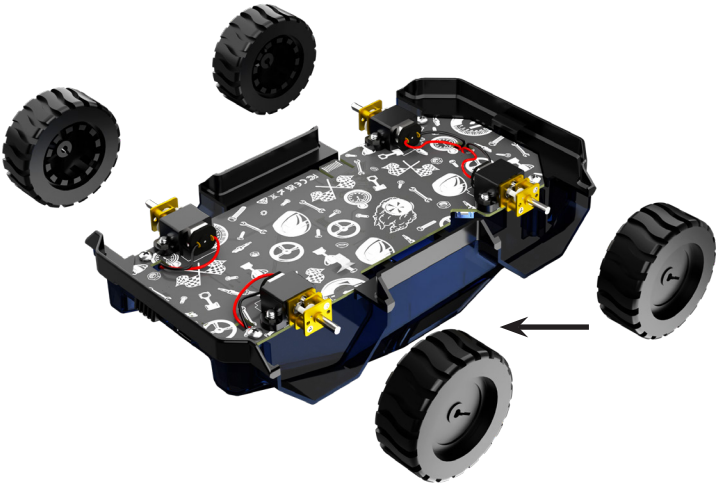

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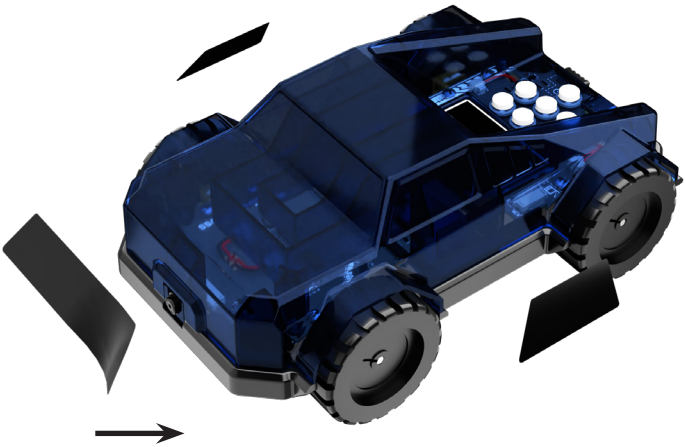

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Scan the QR code to learn how to use your device

Questions and answers

1. What will I learn by building and using Wheelson?

By assembling and programming Wheelson, you'll gain hands-on experience with robotics, electronics, and AI. You'll learn about computer vision, autonomous navigation, and how sensors like LiDAR and HDR cameras enable a car to perceive its environment. Programming Wheelson using CircuitBlocks, Python, or C++ will also enhance your coding skills.

2. Can I control Wheelson manually, or is it only autonomous?

While Wheelson is designed as a self-driving car, you can also control it manually using the CircuitMess ByteBoi game console. This feature allows for interactive play and further exploration of its capabilities

3. What programming languages can I use with Wheelson?

Wheelson is compatible with CircuitBlocks, a beginner-friendly, block-based coding environment. For more advanced users, programming in Python or C++ (Arduino) is also supported, providing flexibility for various skill levels.

4. Can Wheelson recognize and follow objects?

Yes, Wheelson is equipped with computer vision capabilities. It can perform tasks like line tracking, ball tracking, and marker recognition using its built-in camera and AI algorithms

5. Can I control Wheelson remotely using ByteBoi?

Yes! Wheelson can be controlled remotely using the ByteBoi console. To set this up, go to the Wheelson RC app on your Byteboi.

6. How can I restore Wheelson's firmware?

Go to code.circuitmess.com, select "Restore firmware," and connect your Wheelson while it's turned ON. Be sure to choose the correct COM port when prompted for a smooth restoration process.


CircuitMess

Thank you for purchasing CircuitMess Wheelson Educational kit

For more information and detailed instructions on assembling and using your device, visit our official website: circuitmess.com/resources/guides.

Important safety information for CircuitMess Wheelson

Read all safety information before using the device.

WARNING: Failure to follow these safety instructions could result in fire, electric shock, injury, and damage to your device or other objects. Read all safety information before assembling and using this device.

This product is a do-it-yourself device, and for it to work properly, you must assemble it according to the instructions you'll find on our website.

If you are a minor, assemble it only under an adult's supervision to avoid potential risks.

Improper handling can result in burns, injuries, and property damage, so handle the screwdriver or any other supplied tools and electronic components that are an integral part of this do-it-yourself kit very carefully.

Handling a screwdriver is not recommended for children under the age of 7. For children under the age of 18, it is recommended only under the supervision of a more experienced adult.

CircuitMess Wheelson kit contains sensitive electronic components. CircuitMess Wheelson or its components may be damaged if dropped, burned, punctured, crushed, or in contact with liquid.

Use only authorized accessories compatible with your device and/or the supplied tools.

The device's operating temperature ranges from 0 ° C ~ 40 ° C. Using this device in conditions outside this temperature range may damage the device.

Please turn off CircuitMess Wheelson after using it and store it in a safe and dry location.

The included battery must be recycled appropriately and/or disposed of separately from household waste. Improper handling of batteries can cause a fire or explosion. Dispose of or recycle your device, battery, and accessories according to local regulations.

• **The included battery is rechargeable.**

• Do not short-circuit the battery

• Improper use of the battery can cause overheating, burns, or other injuries.

• Do not leave the battery directly exposed to intense sunlight.

• Do not use the device or the battery in high-temperature conditions. Overheating may cause an explosion.

• Do not disassemble or damage the battery to avoid battery leakage, overheating, or explosion.

• In the case of deformation, stop using the battery immediately and dispose of it properly.

If you are not sure whether your device or the included battery is safe to use, turn off the device, put it in a safe place, and contact our customer support via email at contact@circuitmess.com.

Keep the device dry.

Do not attempt to repair the device by yourself.

If any part of the device does not work correctly, contact our customer support (contact@circuitmess.com) or take your device to a certified repair shop.

Connect other devices according to their operating instructions. Do not connect incompatible devices to this device.

Precautions

During prolonged use, Wheelson may rarely overheat.

Keep CircuitMess Wheelson in a ventilated room during the use and the assembly. Pay special attention to this if you suffer from a physical condition that affects your ability to detect heat on your body.

Assembling or using CircuitMess Wheelson in an area with a potentially explosive atmosphere, such as areas where the air contains high levels of flammable chemicals, vapors, or particles (such as dust or metal powder), can be dangerous.

Exposure of CircuitMess Wheelson to environments with high concentrations of industrial chemicals, including liquefied gases that evaporate, such as helium, can damage the functionality of CircuitMess Wheelson.

Do not use CircuitMess Wheelson in hospital operating rooms or intensive care units.

Contact your doctor or our customer support (contact@circuitmess.com) to determine if the device's operation may compromise the work of medical devices.

To avoid possible interference with a pacemaker, maintain a minimum distance of 15 cm between the CircuitMess Wheelson and the pacemaker.

To achieve this, do not carry the included device in your pockets.

Do not use CircuitMess Wheelson near hearing aids or similar medical aids and equipment to avoid interference with medical equipment.

Check aircraft safety regulations and turn off CircuitMess Wheelson on the aircraft if necessary.

Do not use CircuitMess Wheelson while driving.

To avoid lightning strikes, do not use CircuitMess Wheelson outdoor during storms.

Do not use CircuitMess Wheelson in high humidity environments such as bathrooms. Failure to do so may result in electric shock, injury, fire, and damage to the product, electronic components, power adapter, or other parts of this electronic educational kit.

Follow all the rules that limit the use of portable electronic devices in some situations and conditions.

The individual parts and components in the CircuitMess Wheelson can pose a choking risk to children under 36 months. Keep all components, tools, and parts of this product away from small children before and after assembling the device.

Additional Recommendations and Precautions for Parents, Guardians, and Teachers Buying CircuitMess Wheelson for Children

1. Carefully follow the instructions for adequately assembling CircuitMess Wheelson. Keep these and all other instructions that came with the products in a safe place.

2. Supervise your child while assembling and using the CircuitMess Wheelson. Your responsibility is to ensure that the child uses the CircuitMess Wheelson correctly and that the CircuitMess Wheelson is suitable for the child's age and abilities.

3. Check from time to time if CircuitMess Wheelson is damaged or worn out in any way to prevent possible injuries and risks for the child's health and safety. If CircuitMess Wheelson is damaged, remove it immediately.

4. Remove any unnecessary packaging, but keep the instructions. Take care that children do not play with any plastic packaging as there are suffocation risks.

5. Teach children to always store CircuitMess Wheelson and other parts of the CircuitMess Wheelson educational kit appropriately to prevent accidents. Do not leave CircuitMess Wheelson on stairs or on the floor in your home or classroom where someone can step on them.

6. Always report a product security issue to our customer support (contact@circuitmess.com)

Declaration of Conformity

CircuitMess d.o.o. declares that this DIY educational kit CircuitMess Wheelson model complies with the essential requirements and all other relevant provisions of Directive 2014/53 / EU. The full text of the EU declaration of conformity is available at the following Internet address: circuitmess.com/certification.

Legal Information

This device can be used in all EU Member States. Check all the national and local regulations about using the device. This device may be restricted for use, depending on local laws.

Manufacturer:

CircuitMess, Inc.

651 N Broad St, Suite

206, Middletown, 19709

New Castle,

Delaware

Proper disposal of this product

WEEE markings on the product indicate that this product may not be disposed of with the rest of your household waste in the EU. To prevent possible damage to the environment or human health from uncontrolled waste disposal, recycle the product responsibly. Recycling promotes the sustainable reuse of resources. For more information on the disposal of electrical and electronic equipment, don't hesitate to contact your local household waste disposal service, the store where you purchased the kit, or our customer support (contact@circuitmess.com).

IMPORTANT! Warranty conditions:

The warranty is valid only if the original invoice is attached to the product as proof of purchase during the complaint. If the customer sends the product for repair for any reason not covered by the warranty, the customer may be charged for inspection and testing, and delivery costs.

WARRANTY STATEMENT

CircuitMess d.o.o., with its registered office in New Castle, Delaware, 651 N Broad St, Suite, 206, Middletown, 19709, guarantees the quality and proper functionality of the components that come in the CircuitMess Wheelson DIY educational kit for a duration of 24 months from the date of purchase.

If the assembled device does not work correctly due to defects in supplied parts or electronic components supplied in the CircuitMess Wheelson DIY educational kit, CircuitMess d.o.o. will repair the product or send an equivalent replacement product at their own expense.

In case you are experiencing assembly or functionality difficulties with your device, please contact us via email (contact@circuitmess.com).

Please include a detailed description of the problem.

If you are sending the product to a repair shop, it is recommended to deliver the product in the original packaging to protect it from potential damage during transportation.

WARRANTY CONDITIONS

• The warranty period begins on the day of sale indicated on the invoice.

• The warranty is valid upon presentation of the original invoice.

• If the defect is not remedied within a reasonable period after receiving the product for repair, CircuitMess d.o.o. will replace it with a new product.

The repair shop does not take responsibility for storing and/ or losing personal data while repairing the device.

WARRANTY DOES NOT COVER

• Upgrades, alterations,

modifications to hardware and/ or software without the written consent of CircuitMess d.o.o.

• Malfunctions due to improper handling, faults due to wear of the device and/or its parts (if you need help with assembly or if you have difficulty using the device after assembling it, please contact us at contact@circuitmess.com).

• Defects caused by external particles (including, but not limited to: staples, waste, dust, and food) and external factors (including, but not limited to: moisture, water, and thermal damage).

• Mechanical damage and/ or failures caused by mechanical damage

• Use of the product for a purpose for which it is not intended

• Requirements for the appearance, technical functionalities, and/ or capabilities of the product outside the manufacturer's specifications and/or standards.

• Damages to personal data, other tangible and/or intangible assets of the buyer and/or third parties, indirect damages, lost profits caused by the use of the product, and/or its failure.

• Repairs in an unauthorized repair shop and/or installation of non-original spare parts.

• Damage caused during transportation caused by improper packaging.

The rights under this warranty are the exclusive and final rights of the customer unless otherwise provided by national law.

CircuitMess d.o.o. as the warranty provider and/or its authorized partners will not be liable for any defect, damage, loss, direct or indirect cost, or connection with the delivered products outside the warranty conditions written here.

This warranty does not affect other rights of the customer belonging to him on other legal grounds.

FCC STATEMENT:

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation. This equipment has been tested and found to comply with the limits for Class B digital devices pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference to radio communications. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communication.

However, there is no guarantee that interference will not occur in a particular installation. If this toy does cause interference to radio or television reception, you can check this by turning the toy off and on while listening for the interference), one or more of the following measures may be useful. • Reorient or relocate the receiving antenna • Increase the separation between the toy and the radio or the TV • Consult the dealer or an experienced TV-radio technician for help.

NOTE: Changes, adjustments or modifications to this unit, including but not limited to the replacement of any transmitter component (crystal, semiconductor, etc), could result in a violation of FCC rules under pad 15 and/or 95 and must be expressly approved by CircuitMess d.o.o. or they could void the user's authority to operate the equipment.

Photosensitivity / epilepsy warning:

A very small percentage of individuals may experience epileptic seizures when exposed to certain light patterns or flashing lights. Exposure to certain patterns may induce an epileptic seizure

in these individuals. Certain conditions may induce previously undetected epileptic symptoms even in persons who have no history of prior seizures or epilepsy. If you, or anyone in your family, have an epileptic condition, consult your physician before playing.
If you experience any of the following symptoms while using the product - dizziness, altered vision, eye or muscle twitches, loss of awareness, disorientation, any involuntary movement, or convulsions - immediately discontinue use and consult your physician before resuming play.

WARNING:
This toy produces flashes that may trigger epilepsy in sensitised individuals.

⚠ **WARNING: CHOKING HAZARD - Small parts.** Not for children under 3 years.

WARRANTY SHEET

Product name:	CircuitMess Wheelson do-it-yourself educational kit
Warranty on components and parts contained in this set is:	24 months
Date of purchase:	
Seller and point of sale stamp:	
Invoice number:	

Information on interventions during warranty period is entered by a repair shop technician at an authorized repair shop.

Received on	Issued on	Fault description	Warranty extension

CircuitMess

Manufacturer:

CircuitMess, Inc.
651 N Broad St, Suite 206, Middletown, 19709
New Castle,
Delaware
Country of origin: China
www.circuitmess.com

Authorized repair shop:

CircuitMess, Inc.
651 N Broad St, Suite 206, Middletown, 19709
New Castle,
Delaware
Country of origin: China
www.circuitmess.com

CircuitMess