Robots, Parts, and Custom Solutions

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LT2-F Compact Treaded All Terrain Surveillance & Inspection Robot

The LT2-F was qualified during a series of NIST tests. The robot package includes a complete robot including the, a selection of a custom remote, and selection of a front tilt camera, and battery charging station.
The LT2-F is capable of climbing household stairs and obstacles, very maneuverable, able to inspect under vehicles and houses. It can also be equipped with 2 way audio for hostage negotiation.

LT2-F Robot Specifications:

- Enclosed treaded robot chassis with new integrated flush camera tilt system in the nose of the robot.
- Flipper Arm/Stabilizer arm can be used to climb over objects as tall as the robot is long. The arm can be used as a wheelie bar from climbing up stairs, etc.
- Compact design with all components carefully placed for optimum spacing and most effective operation using solid modeling 3-D CAD software
- LT2 Tracks and wheels - Standard Tread or LT2 Tracks and Wheels - Aggressive Tread
- Two (2) planetary IG52-04 285RPM 24VDC gear motors - one per side
- Two 12.8V LiFePO4 batteries run in series. Run time ~2.5 to 8 hours depending on use
- Custom Dual 25Amp drive dual motor controller specifically designed for this robot
- Custom 10Amp Flipper arm motor controller specifically designed for this robot
- Fuse blocks, terminal blocks, charging ports, switch, etc. all integrated into the design
- Integrated nylon carrying strap on the rear or the robot
- Chassis made from heavy gage aluminum that is laser cut and CNC bent. Chassis seams are welded. Entire body is coated flat black.
- Total weight of fully assembled robot: ~45lbs
- Total height (floor to top of treads or camera housing): ~7 inches, total width: ~18.625 inches, total length: ~27 inches
- 7" composite rubber and UHMW cogged wheels that match a positive traction aggressive all terrain tread
- Ground clearance: ~2 inches
- Speed: 0 to 5 feet per second, infinitely adjustable/controllable

LT2-F Controllers:

There are many different methods to control a robot. This page is a general overview of the most popular methods SuperDroid Robots offers. We have built many robot controllers using the methods described below, combinations of the methods (i.e. tethered and wireless). We specialize in customizing the control packages to meet your needs and budget. SuperDroid Robots has extensive experience implementing all of the options discussed below. Please review the methods below. Most of these controls are offered as standard options on our Tactical Robots, but if you want a custom control package of combination of controls, just let us know. Wireless control and video monitoring is tricky and can be affected by several factors such as walls, electrical interference, landscape, other RF interference, etc. We offer many different methods for video and data transmission. The range (distance) you can achieve is greatly influenced by the above. We also offer many tethered (wired) options where RF is not possible.

Method	Analog 2.4GHz DSM Data, 900MHz Video	Digital 802.11b/g/n Wi-Fi	Digital COFDM (Coded Orthogonal Frequency Division Multiplexing)	Digital Tethered
Description	This control method is our most popular for Tactical robots. It is considered an analog system and does not perform as well as a digital system, but if very good for most applications. **Video Transmission:** Video is sent back with a 900MHz transmitter. The receiver is mounted to the controller and the video is transmitted to a color LCD. **RC Control:** Standard versions include a 5, 6, 7, 8 and 16 Channel 2.4GHz frequency spectrum control system (searches for best most reliable channel) with a Fail Safe long range dual receiver. Typically 4 channels are used to drive the robot (drive, turn, pan and tilt). Extra channels are need for zoom control, lights, remote release hitches, arms, etc. For our arms we can use a standard 8 channel or we can add 8 more channels. If only 8 channels are used for an arm we use a channel to changed modes (i.e. arm mode and camera mode using only eight channels, but the arm and drive cannot be used simultaneously.)	Wi-Fi has been around for a long time now and is an easy and cost effective way of controlling a robot. The main disadvantage is range. We typically install a wireless router inside the robot. The Wi-Fi SSID is broadcast from the robot once its power up, then the user connects the laptop or wireless adaptor to the router and runs a custom SuperDroid Robots program to control the robot and monitor the video. Using Wi-Fi, there is not real limit to the number of channels since its controls are sent via serial packet, any number of channels can be transmitted.	Coded Orthogonal Frequency Division Multiplexing (COFDM) is virtually identical to OFDM, except FEC (Forward Error Correction) is applied to the signal before transmission. The purpose of FEC is to overcome errors (lost bits) in transmission due to lost carriers from fading, noise, interference (mechanical or harmonic) and other environmental variables. The main difference is image quality, especially while the transmitter is in motion. Whereas analog video transmission tends to break up periodically from multipath or interference, digital systems provide you with high quality images right until the edge of reception. The primary advantage of OFDM over a single-carrier scheme (AM/FM) is its ability to overcome severe channel condition (Multipath, fading, attenuation) without equalization filters. Channel equalization is achieved by using many slowly-modulated narrow-band signals rather than a single rapidly modulated wide-band signal. Using COFDM, there is not real limit to the number of channels since its controls are sent via serial packet, any number of channels can be transmitted.	Tethered control is as the name implies, the robot is tethered. The obvious advantage of this is there are no wireless interference issues. The disadvantage is the robot must pull a cable behind itself. The tether can be a network cable (limited to about 100meters) or fiber optic. With a Wi-Fi or COFDM control, the tethered option can also be added as an alternate control method (so depending on the scenario of when and where the robot is being operated it can run either wireless or tethered. Using a tether, there is not real limit to the number of channels since its controls are sent via serial packet, any number of channels can be transmitted.

Encryption (Security)	Video is **NOT** Encrypted or secure. Anyone with an analog video receiver can intercept the video feed.	The digital systems use a secure wireless private connection so video feed cannot be intercepted.		With a tethered system, nothing is broadcast wirelessly therefore it cannot be intercepted unless someone splices into your tether.
Data (control)Transfer	**Data transfer is one way.** From the remote to the robot.	**Data transfer is Two-Way (Bidirectional).** The data will be sent to the robot, the robot then responds back to the remote. Using this method confirms data transmission and can also be used to provide robot voltages, arm positions, etc.		
Video Transfer	Video is one way. From the robot to the remote. Two way video is possible with Wi-Fi or Tethered upon request.			
Audio	Audio is possible from the robot to the remote with optional microphone added. Audio from the remote to the robot (for negotiation) is also possible. We supply a two way radios and mount a PA speaker on the robot.	Audio from the robot to the computer is possible with an optional microphone added. Audio from the remote to the robot (for negotiation) is also possible with an optional PA speaker mounted on the robot.	Audio from the robot to the remote is possible with an optional microphone added. Audio from the remote to the robot (for negotiation) is also possible with an optional PA speaker mounted on the robot.	Audio from the robot to the computer or remote is possible with an optional microphone added. Audio from the remote to the robot (for negotiation) is also possible with an optional PA speaker mounted on the robot.
Range	Tested urban range 200+ yards (effective operation range for video and control with multiple building structures, wireless interference, etc. Concrete and steel walls will reduce range further). Tested rural line of site range 1000+ feet with optimum conditions and high gain antennas.	Wi-Fi systems are limited in range. 300 feet is typical. With line of site 600 or more feet can be achieved.	COFDM can work on many different frequencies. The lower frequencies will have better penetration. The higher frequencies will have better line of site performance. Typical ranges 1000 ft. to 1 mile.	Tethered systems provide a clean signal regardless of RF interference or shielding. Network cables are limited to about 100 meters. Fiber Optic cables are have no limit other that what the robot is capable of pulling. We have built cable spooling systems to aid in this. Contact us if interested in tethered options.
Range Extenders and/or Repeaters	Higher output transmitters for video and extra/ high gain antennas can be used to boost the range slightly.	High Gain antennas can be used on the robot to extend range. Repeaters can all be used, but they need to be supplied power. Contact us if interested in repeating options.	COFDM can be repeated. We have provided secondary remote monitors (for negotiators or a second entry team) that serves as a repeater. Contact us if interested in repeating options.	Not Applicable
Remote Options (see table below for details on our remotes)	Handheld Enclosed Handheld Enclosed (Pelican style) Case Pelican (Pelican style) Case 16 channel (for arm versions only)	Standard remote for this is a customer supplied laptop running Windows OS. Many other options are available, such as tablets, Pelican Case remotes with built in PC, etc. Let us know if you want a custom Wi-Fi controller.	We offer COFDM with a Enclosed Case Style only. The panel can be configured with multiple joysticks based on the robot being used.	Standard remote for this is a customer supplied laptop running Windows OS. Many other options are available, such as tablets, Pelican Case remotes with built in PC, etc. Let us know if you want a custom tethered controller.

Below are the many remote styles we sell. We also manufacture a lot custom remotes too. Contact us if you are interested in a custom remote. The remotes are intended to be installed in SuperDroid Robots Tactical Robots only. The remotes may work in other robots, but will likely require some customization to accommodate the different setups including motor controllers, cameras, etc.

Standard Remote Type	Image	Description
Handheld Analog 5 Channel Tactical Robot Controller		This is a custom built handheld remote using a standard 5 channel 2.4Ghz DSM remote with a 7 inch color LCD mounted on a bracket with battery, regulators, and 900 MHz video receiver. It also includes the 900MHz video transmitter and 2.4GHz receiver.

Handheld Analog 6 Channel Tactical Robot Controller		This is a custom built handheld remote using a standard 5 channel 2.4Ghz DSM remote with a 7 inch color LCD mounted on a bracket with battery, regulators, and 900 MHz video receiver. It also includes the 900MHz video transmitter and 2.4GHz receiver.
Handheld Analog 7 Channel Tactical Robot Controller		This is a custom built handheld remote using a standard 5 channel 2.4Ghz DSM remote with a 7 inch color LCD mounted on a bracket with battery, regulators, and 900 MHz video receiver. It also includes the 900MHz video transmitter and 2.4GHz receiver.
Enclosed Handheld Analog 8 Channel Tactical Robot Controller		This is a custom built Encased handheld remote using a 8 channel 2.4Ghz DSM remote with a 7 inch color panel mount LCD with joysticks, batteries, regulators, touchpad LCD, and 900 MHz video receiver. It also includes the 900MHz video transmitter and 2.4GHz receiver.
Enclosed Case Analog 8 Channel Tactical Robot Controller		This is a custom built Enclosed Case (Pelican Case Style) Remote using a 8 channel 2.4Ghz DSM remote with a 7 inch color LCD with joysticks, batteries, regulators, touchpad LCD, and 900 MHz video receiver. It also includes the 900MHz video transmitter and 2.4GHz receiver.

Enclosed Case Analog 16 Channel Tactical Robot Controller		This is a custom built Enclosed Case (Pelican Case Style) Remote using a 16 channel 2.4Ghz DSM remote with a 7 inch color LCD with joysticks, batteries, regulators, touchpad LCD, and 900 MHz video receiver. It also includes the 900MHz video transmitter and 2.4GHz receiver.
Wi-Fi Tactical Robot Controller		This package is for controlling SDR Tactical Robots. It contains a Wi-Fi Router, iPocket232, Switching Power Supplies, Custom Controller Board, USB Gamepad, Custom .NET PC program. It does NOT include a PC/Laptop.
Enclosed Case COFDM Tactical Robot Controller		This is a custom built Encased case (Pelican style) remote with a Digital C-OFDM Radio with video, audio, and control data. The remote has a 7 inch LCD with joysticks, batteries, regulators, and custom panel. It also includes the radio and components for the robot.

LT2-F Video Camera Options:

- Embedded Nose Tilt 27X Zoom Camera
  - This camera system is mounted in the nose of the LT
  - It has 180 degrees of tilt
  - It has a High Resolution day and night 27X optical zoom camera.
  - The tilt and zoom are controlled with the remotes listed above
- Embedded Nose Tilt IR Camera
  - This camera system is mounted in the nose of the LT
  - It has a High Resolution day and night IR camera.
  - The tilt is controlled with the remotes listed above.
- Other Camera Options available upon request. Including Pan Tilt Zoom Cameras mounted to the top of the LT2-F. These cameras can be made removable too so depending on the task/mission the robot can be configured with the PTZ camera or without for lower profile surveillance.

Battery Charging:

- SuperDroid Robots use LiFePO4 and Lithium-Ion batteries in the HD2-S built in 2012 or later. The batteries are lighter and hold more charge than lead acid batteries per pound.
- These batteries have circuit protection built in to prevent total discharge or overload.
- The Batteries require special charging considerations.
- Other Battery options are available upon request.

LT2-F Upgrades and Add-On Options:

- ***Upgrade LT-F with Flipper Arm Positioning Control.*** This option is for the LT-F robot and can only be used with the Pelican Case Remote. The LT-F comes with a standard speed controller on the flipper arm that allow the operator to control the speed and direction of the arm. With the position control option the operator can control the flipper arm by position. The operator just adjusts the position on the remote and the flipper arm will position itself and hold that position. This makes operation a lot simpler in a remote environment because it eliminates the guess work of where the arm is.
- ***Standard Robot Microphone (for Audio from Robot to Remote).*** This add-on installs a microphone on the robot with an amplifier for picking up distant and faint noises. The microphone is a standard compact microphone that is meant for listening to large areas. The microphone will be mounted to the robot and the audio will be transmitted back with the video transmitter via the audio channel. The audio will be broadcast real time on the 7" Color LCD. Volume of the audio can be adjusted on the 7" monitor. The gain, etc of the amplifier is set up on the robot.
- ***PA System (for Audio from Remote to the Robot).*** This add-on allows the user to use a hand held radio to broadcast to the robot through a loud speaker PA system. Using this option along with the above microphone allows 2 way communication between the remote users and the robot. The PA speaker is shown on the robot picture on page one of this datasheet.
- ***Upgrade LT-F with 4-Axis Arm.*** SuperDroid Robots offers many different custom arms. Contact us for different arm configurations, such as position control arms, clutches, more or less axis and/or degrees of freedom. This 4 axis arm includes a shoulder joint that can rotate 180 degrees. An elbow joint that can rotate ~140 degrees, a continuous turn wrist, and a gripper. Each arm axis is directly driven with gear motors with speed control. The arm also includes the necessary controls to control the arm from our controller.

Pricing:

Pricing is subject to change without notice. Contact SuperDroid Robots for formal quotation.

Recommended Features		Cost	Detail of Item
Ext Cost	Qty		
			LT2 / LT2-F Base Robot
$4,607.87	1	$4,607.87	LT2 Tank with motors, batteries, motor controller, motor mounts, paint, and assembly
$1,641.39	1	$1,641.39	Flipper Arm and Assembly
$0.00		$226.54	Roll Cage Assembly
			LT2 / LT2-F Remotes and/or Control Systems
			Standard Analog Remote Control System
$1,496.13	1	$1,496.13	Handheld Dx5e Remote with RF Video and 7" Color LCD
$0.00		$1,850.47	Encased Handheld Dx5e Remote with RF Video and 7" Color LCD plus Yagi Antenna
$0.00		$1,869.65	Pelican Case Dx5e Remote with RF Video and 7" Color LCD plus Yagi Antenna
$0.00		$1,745.14	Handheld Dx7 Remote with RF Video and 7" Color LCD plus Yagi Antenna
$0.00		$2,406.47	Encased Handheld 8 channel DSM2 Remote with RF Video and 7" Color LCD plus Yagi Antenna
$0.00		$2,488.56	Pelican Case 8 channel DSM2 Remote with RF Video and 7" Color LCD plus Yagi Antenna
$0.00		$3,563.20	Pelican Case 16 channel DSM2 Remote with RF Video and 7" Color LCD plus Yagi Antenna
$0.00		$270.00	Upgrade Video Transmitter Power, Add Low Pass Filter, and Add Extra Data Receiver
$0.00		$525.50	Portable Handheld Extra 7" LCD Video Receiver Pack with Yagi Antenna
			C-OFDM Digital Radio System
$0.00		$9,132.13	Pelican Case Encrypted Digital COFDM Radio System with Video, 2-way Audio, and Data/Control
$0.00		$3,973.99	Pelican Case Encrypted Digital COFDM 2nd Monitoring Station/Repeater/Extender
			WiFi Control Methods:
$0.00		$1,772.47	WiFi Bridge, Controller, Custom Robot control Interface, Video Server (PC not included)
$0.00		$2,163.30	WiFi Bridge, Controller, Custom Robot control Interface with Encoder Feedback, Video Server (PC not included)
$0.00		$439.00	Acer Aspire ONE notebook with software installed and configured to robot
			Tethered Control Methods:
$0.00		$949.50	Convert Wifi Package to Tethered Fiber Optic System
$0.00		$795.00	Indoor/Outdoor Fiber Optic Cable - 1000 feet
			LT2 / LT2-F Camera Systems
$722.05	1	$722.05	LT Color IR Camera 180 degree Tilt System embedded in nose of robot
$0.00		$1,361.50	LT Color 27X Optical Zoom Camera 180 degree Tilt System embedded in nose of robot
$0.00		$1,983.52	LT Color IR Camera 180 Degree Pan and 90 Degree Tilt with Roll Cage mounted on top of robot.
$0.00		$1,925.00	360 Pan Tilt 27X Zoom Camera System under 8inch dome
$0.00		$2,422.00	360 Pan Tilt 27X Zoom Camera Removable Flush Mounted Camera
$0.00		$1,050.00	360 Pan Tilt 3X Zoom Camera System under 4inch dome
$0.00		$1,050.00	360 Pan Tilt 3X Zoom Camera System under 4inch dome
$0.00		$10,563.45	8 Foot Lift System with 360 Pan, 90 degree Tilt, IR camera, Controls, Mounting, Wiring, and Assembly
$0.00		$458.15	LT Rear Color IR Camera with video switch
$0.00		$642.94	IR Camera mounted on arm with video switch
$0.00		$926.44	IR Camera mounted on Arm, Rear Camera, camera Video Switch
			LT2 / LT2-F Arm Options
$0.00		$7,987.53	4 Axis Arm (~180 degree Shoulder, ~140 degree Elbow, Continuous Wrist Twist, ~5.5 inch Gripper)
$0.00		$1,849.62	Removable Mount and Electrical Hookup for 4 Axis Arm
			LT2 / LT2-F Misc. Options, Add-Ons, and/or Accessories
$0.00		$282.98	Position Feedback of Flipper Arm. Only Available on Digital Control Systems
$0.00		$427.00	Positioning Control of Flipper Arm (move and hold to set positions). Only Available on Digital Control Systems with Flipper Arm Position Feedback.
$0.00		$199.00	Standard Microphone Embedded in the Nose of Robot
$0.00		$267.00	PA system with radio for broadcasting from remote to robot
$0.00		$148.20	Remotely Operated mounted LED lights
$0.00		$264.15	Remote Release Hitch
			LT2 / LT2-F Battery Charging
$443.10	1	$443.10	Smart Charger Battery Charging Station (Charger for each battery in custom case)
$0.00		$371.27	Battery Charging Station Maintenance and Cutoff Timer System
			LT2 / LT2-F Shipping
$0.00		$419.00	Standard Pelican Case
$0.00		$876.50	Heavy Duty Custom Shipping and Storage Case for LT with Arm
$0.00		$320.00	Estimated Shipping from NC US
			LT2 / LT2-F Recommended Spares
$0.00		$419.48	Spare LiFePO4 Drive Batteries and Li-Ion Control Battery for robot
$0.00		$905.34	Spare Treads and Wheels for LT Robot
$0.00		$359.21	Spare Flipper Arms
$8,910.53		**Recommended LT2 Surveillance Robot**	

Standard Payment Terms:

1. Payment via check, money order, or wire transfer is required.
2. Sixty percent (60%) of price due upon award, remainder prior to shipment.

Delivery:

1. Procurement of materials, assembly and testing is required. Lead time is typically 3-8 weeks.

General Terms:

1. SuperDroid Robots, Inc is not responsible for special incidental, or consequential damages resulting from any warranty or under any legal theory, including, but not limited to lost profits, downtime, goodwill, damage to, or replacement equipment or property, or any cost of recovering, reprogramming, or reproducing any data stored. ANY LIABILITY SHALL BE LIMITED TO REPLACEMENT OF DEFECTIVE PARTS. SuperDroid Robots, Inc. is further not responsible for any personal damages, including, but not limited to bodily and health damages resulting from any use of our products.
2. SuperDroid Robots, Inc. makes no representations as to the fitness of its products for specific uses. ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE IS HEREBY EXCLUDED.
3. Agreements shall be construed in accordance with the laws of the State of North Carolina, and the rights and obligations created hereby shall be governed by the laws of North Carolina.
4. In the event a dispute or controversy arises, such dispute or controversy (including claims of default) shall be brought in the courts of Wake County, North Carolina and the plaintiff hereby agrees to this choice of venue.

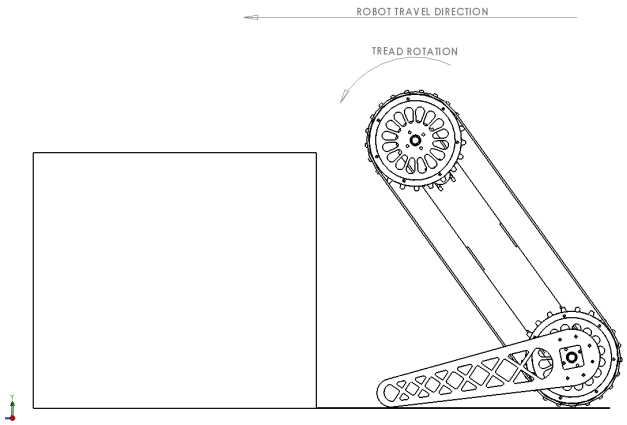
Warranty:

1. SuperDroid Robots will repair any manufacturing defects for 120 days after shipment. Damage from abuse or neglect will not be covered. The cost of shipping is not covered in the warranty. Additional warranty options are available upon request.
2. Consumable items will not be covered by the warranty. Consumable items include, but are not limited to treads, chains, bearings, wheels, and batteries.
3. Extended warranties, spare parts, and maintenance training is available, contact us with specific needs. Service agreements are also available, but never forced upon you!

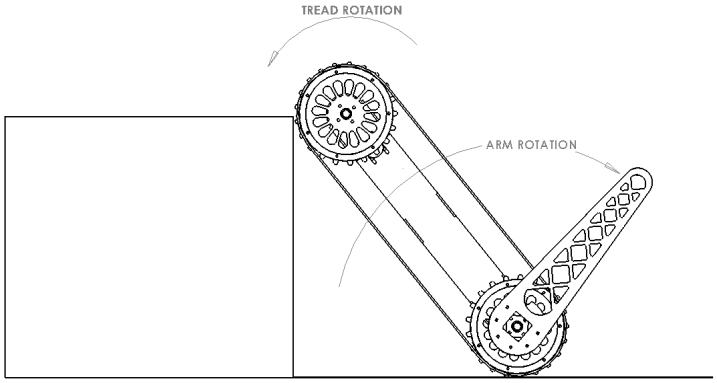
LT-F Flipper/Stabilizer Arm Description (Patent Pending):

A rugged robot platform with multipurpose rear stabilizer arms. The arms are located on the rear of the robot and have a rounded or wheeled front tip. The rear arms are approximately 2/3 the length of the robot. When rotated down the arms lift the front of the robot off the ground allowing it to move on top of objects as tall as the robot chassis' length. With the front of the robot on the object, the arms then rotate upwards continuing until the rear of the robot is lifted as high as the arms are long. The robot can then travel onto the object and rotate the arms back into parked position keeping them out of the way.

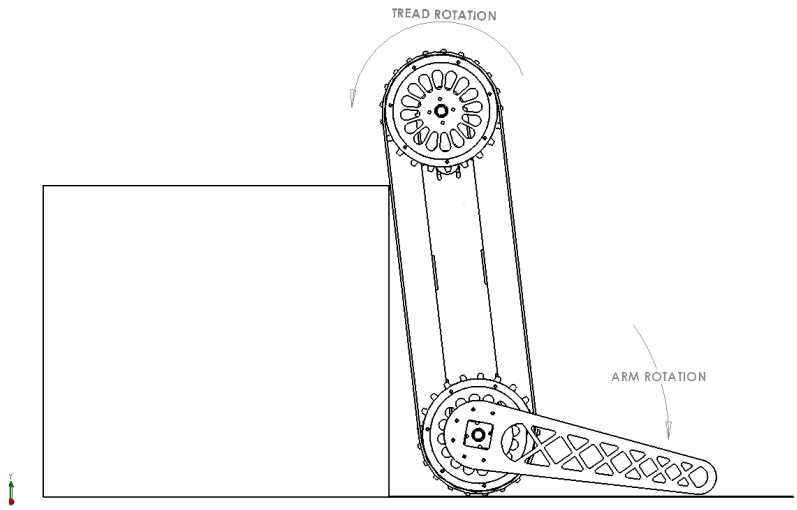
1. The arms are used for climbing an obstacle:



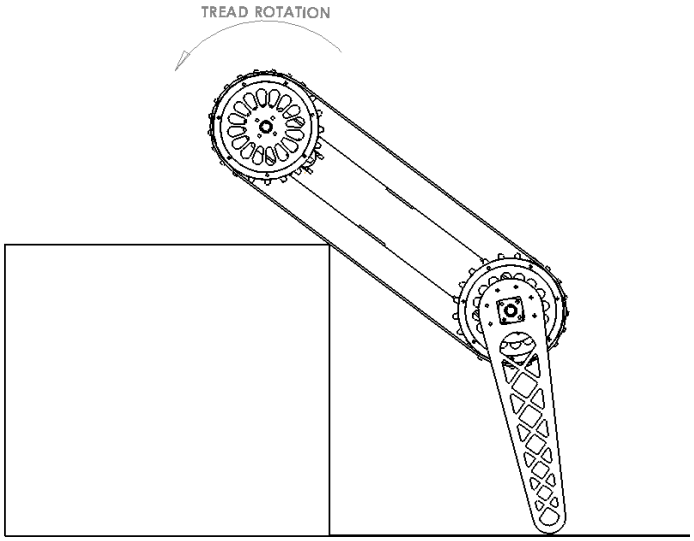
Step 1: The arms have lifted the front of the robot up to the height of the object it is about to climb. The rounded front ends of the arms allow the robot to still travel in a forward motion until it reaches the object.



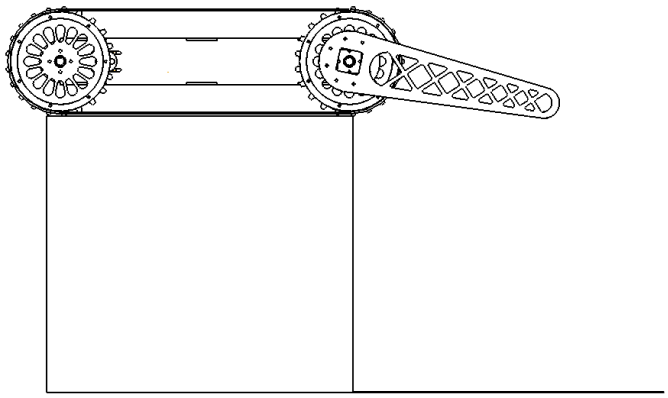
Step 2: The robot is now resting on the object while the arms are rotated backwards. The treads are moving slowly forward at this time.



Step 3: The arms and treads continue to move in the same direction as in step 2. The arms are strong enough to lift the entire weight of the robot off the ground.

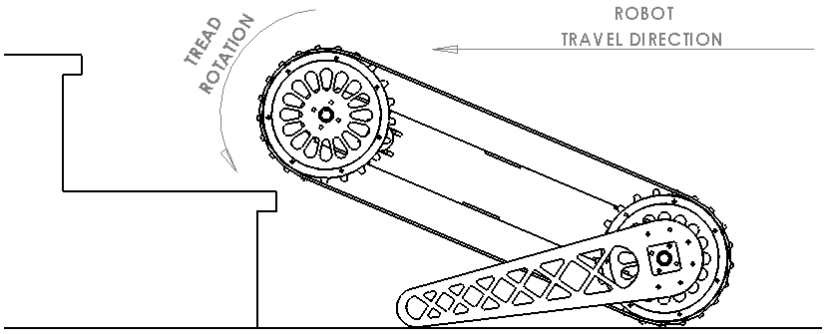


Step 4: The robot is now moving forward and the arms are only stabilizing the robot from flipping over. If the robot does fall over backwards or the object is too tall, the arms can simply flip the robot upright.

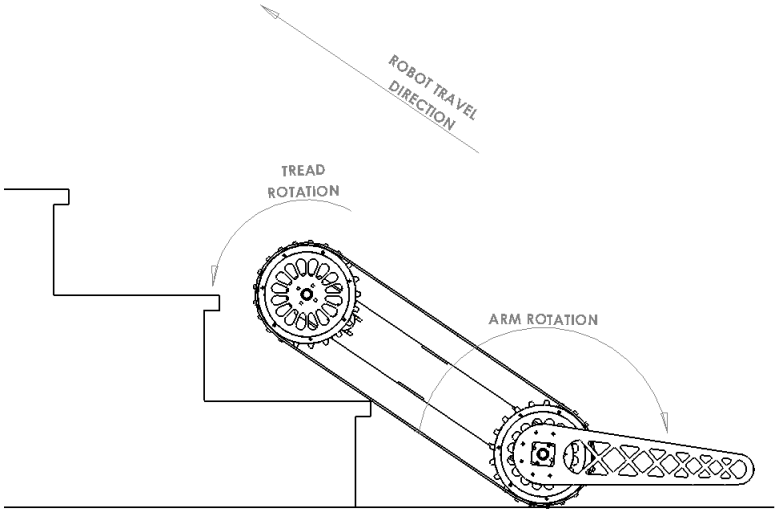


Step 5: The robot has now climbed on top of the object. The multipurpose arms can now be rotated back into a position that the next object requires.

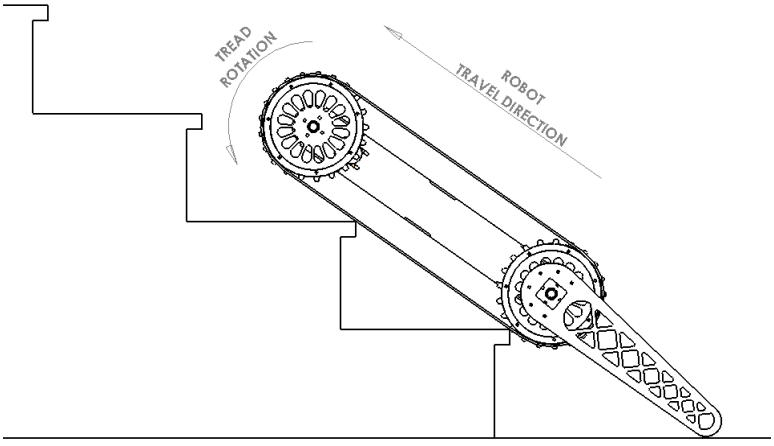
2. The arms used for climbing stairs.



Step 1: The robot has lifted the front end up high enough to clear the first step. The robot then drives forward just far enough to rest on the top of the first step.



Step 2: The arms are rotated in the direction of the arrow shown. Once the arms are about to reach the ground the robot can drive forward. The arms act as a stabilizer bar that prevents it from turning over.



The robot can now climb the stairs without flipping over backwards.