Coat Hanger ROV

A simple version of a remotely-operated vehicle

Keep in mind the things every ROV needs:

1. Structure
2. Flotation
3. Ballast
4. Power
5. Propulsion
6. Control
7. Navigation

Parts:

Plastic coat hanger
One electric 6 or 12-volt motor
One plastic propeller to fit the motor
10 feet of telephone wire
Duct tape
Pipe insulation
One 9V battery

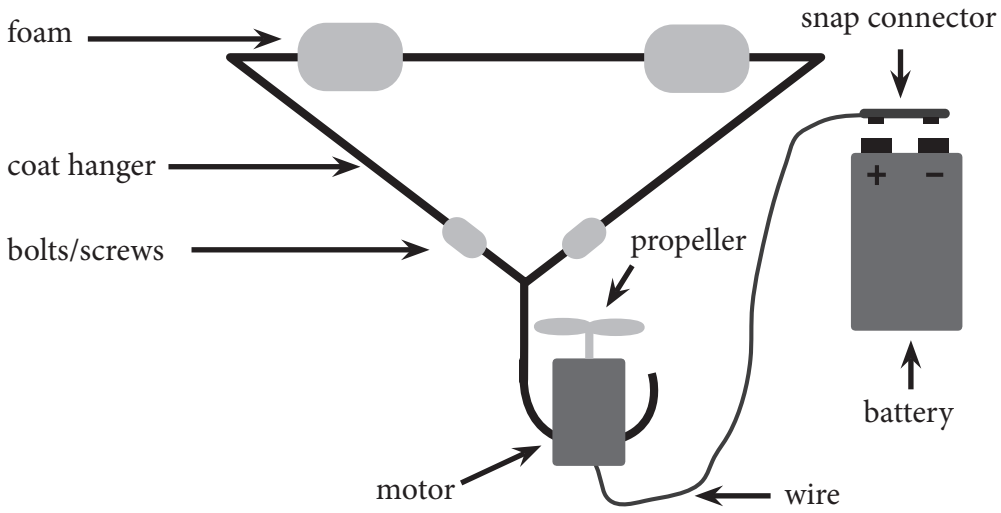
Instructions:

1. Hold the coat hanger so that the "hook" is pointing down. Place it in water and see what happens. Does it float or sink? Does it stay upright or fall over?

2. Based on your observations, experiment with adding flotation and/or weight (called "ballast") to the ROV. Use duct tape to attach foam pipe insulation as floatation to the upper, flat portion of the coat hanger. Tape nails/screws to the "neck" of the coat hanger (see the diagram on the next page). Your goal is to have the ROV float straight up-and-down at or just below the surface of the water.

4. Touch (DON'T snap on) the snap connector at the end of the wire to the battery terminals. As soon as you touch the connector to both terminals, the motor will fire. If the ROV doesn't go down into the water, switch around the connector so that it is touching the opposite battery terminals. This will reverse the direction that the propeller spins.

5. Most ROVs are designed to have neutral buoyancy or slightly positive buoyancy so that they will stay where they are in the water. Their propulsion is then used to move them to different depths or forward/backward. Experiment with your flotation and ballast so that when you send your ROV down into the water and stop the motor, the ROV basically remains where it is. Then you can reverse the polarity on the battery (swap the ends of the connector that touches the battery terminals) to send the ROV back up to the surface.



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Questions to answer:

1. Above is the list of seven things every ROV must have. Look at the diagram. Five of the seven items from the list are labeled. Place the appropriate number by each part of the ROV in the diagram.

2. The control and navigation are missing from the diagram. What is providing the control for your ROV (what is steering it)? How do you navigate where your ROV is "flying"? How does an ROV navigate when it is two miles underwater?

3. How does moving the floats closer together and further apart change the stability of the ROV?

To build this ROV at home:

We adapted our instructions based on the original coat hanger ROV project created by Harry Bohm at the Marine Advanced Technology Education Center in Monterey, California. We did many of the steps ahead-of-time, so if you'd like to build your own ROV at home, take a look at the original instructions: http://seagrant.uaf.edu/marine-ed/curriculum/images/stories/grade6/coathanger_rov.pdf

Specific materials we used for the coat hanger project:

RadioShack® Super Speed 9-18VDC Hobby Motor
Model: 273-256
Usually available in stores or online at www.radioshack.com
$5.99

RadioShack® Heavy-Duty 9V Snap Connectors
Model: 270-324
Usually available in stores or online at www.radioshack.com
$2.99

Propeller
Prop #3003 For .19 to .35 Size Engine 1/8" Hole
Purchased online from Dumas Boats and Airplanes www.dumasproducts.com
$1.20

The hole in the propeller was a little too big for the shaft on the motor, so we purchased some thin aluminum tubing to push inside the propller hole and then trimmed it to size. We then glued the propeller to the motor shaft using a small amount of epoxy, making sure no epoxy was on the shaft where it meets the motor casing (so that it wouldn't inhibit the shaft from spinning).

Aluminum tubing
1/8 x .014 (3.18mm)
Produced by K&S Precision Metals
Stock #8102
We purchased a package of 3 tubes at Wisconsin Craft Market for $1.99

More ROV information:

Build Your Own Underwater Robot and Other Wet Projects
by Harry Bohm and Vickie Jenson
Westcoast Words
Vancouver, B.C., Canada
2010
www.westcoastwords.com/build-your-own-underwater-robot.html

This is the ultimate handbook for how to build your own ROV and other projects. If you are a Wisconsin resident, you can check this out from **Wisconsin's Water Library** (call number 232420) and have it delivered to your local public library: http://aqua.wisc.edu/waterlibrary/

International ROV Competition
www.marinetech.org/rov_competition
The Marine Advanced Technology Education Center sponsors an interantioanl ROV competition as well as several regional competitions. Last year a team from Ozaukee High School took second place in the international competition.

Building the Water Generation ROV Competition
www.glwi.uwm.edu/education/outreach/international-rov.php
This is the Wisconsin regional competition to qualify for the International ROV competition. It is open to any high school student from the Milwaukee Region (Counties of Washington, Waukesha, Walworth, Ozaukee, Milwaukee, Racine and Kenosha).

Open ROV
OpenROV is a DIY community centered around underwater robots for exploration and adventure, made up of professional and amateur ROV builders from over 30 countries. They recently released easy-to-assemble and preassembled ROVs for sale.
www.openrov.com

Build Your Own ROV Online Activity
Build and pilot an ROV to the ocean floor, and take photos of a wreck site at this site. ROV construction requires balancing the load and adjusting buoyancy.
www.immersionlearning.org/index.php?option=com_wrapper&Itemid=216

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