Sentry Bike Radiant Heater

by rabbitcreek on March 26, 2016

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Intro: Sentry Bike Radiant Heater

Making the Arctic livable has challenged humans for at least 50,000 years and with the problems of global warming continues to befuddle us. How do we make our living in cold climates efficient in the utilization of carbon units. Eskimo houses used very little besides a whale oil lamp to heat even the coldest interior space efficiently. That and the heat radiated by humans--about 1000 watts apiece. Central heating systems blow hot air over enormous square foot McMansions only to provide comfort to spiders nesting 30 feet up in a glass atrium. The humans down below that worry about their heating bill and the rising sea level are comfortable but can this be done more efficiently? Radiant heat which is that delivered by high speed photons is different from the convective and conductive heat we normally get. It is the heat of a campfire on our faces that we have evolved with and like. Here we adapt the static Radiant room heater and give it some high tech chops to hunt the house occupants and warm them up (ignoring the spiders). We use the already developed RealSentryGun software and adapt it to a old rusted bike frame with servos to make it happen.

This project is done with support from the **Arctic Comfort** initiative at the **Anchorage Museum at Rasmuson Center**.

Step 1: Gather Parts

The sentry gun software in its various configurations on the web uses an combination of a web cam connected to a computer--usually any laptop will do--that analyzes motion and directs a small hardware unit--either an Arduino or in this case a specialized servo driver from Pololu to give coordinates to two servos that swing a sentry gun or in our case a large wattage radiant heater into aiming position and then fire it with another servo. (Our heater is kept on all the time to minimize warmup lag...) I used a bike frame to support the heater because it provided an already built source of a well built x-y turret system for the heater and it looks cool right? The following are my sources for most of the parts.

Old rusted bike frame beyond redemption but with functional steering bearings and front axel hub

Radiant heater--**Presto HeatDish**--available at **Costco**

Servos--**HS-5685MH Digital Super Torque** x2

SPG400A Servo Power Gearbox x1--from **ServoCity**--you have to follow their great instructions for

modifying one of the above servos to make this work. I used this power head for the lower servo because of carrying so much weight. The upper servo was held in one of **ServoCities ServoBlock** kits that facilitates attachment

RealSentryGun.com--basic unit which includes servo controller and software--you can also use the Processing program and fire up an Arduino to do the same thing--available on **Instructables**, but it is no way in this league and it will cost you more in the long run

Adafruit ProTrinket or any small microcontroler--this is just to run the some fire software for decorating the unit and uses the neopixels below for the output--you can totally skip it if you want...

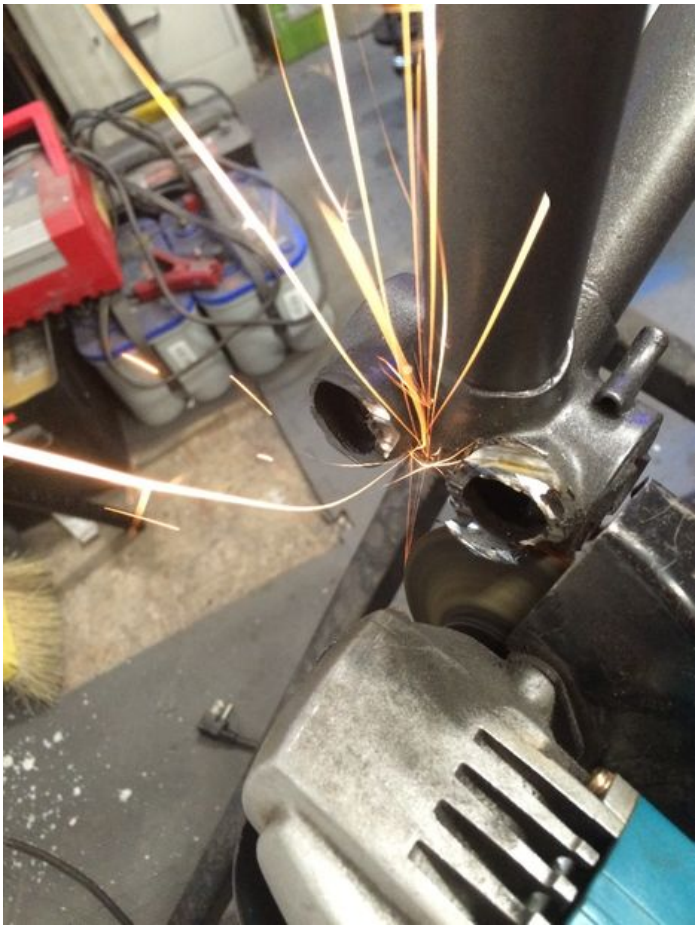
Adafruit NeoPixel chains x2

Angle aluminum various sizes and shapes, washers, tons of nuts bolts, drill press, small band saw are also helpful

Step 2: Cut the frame!

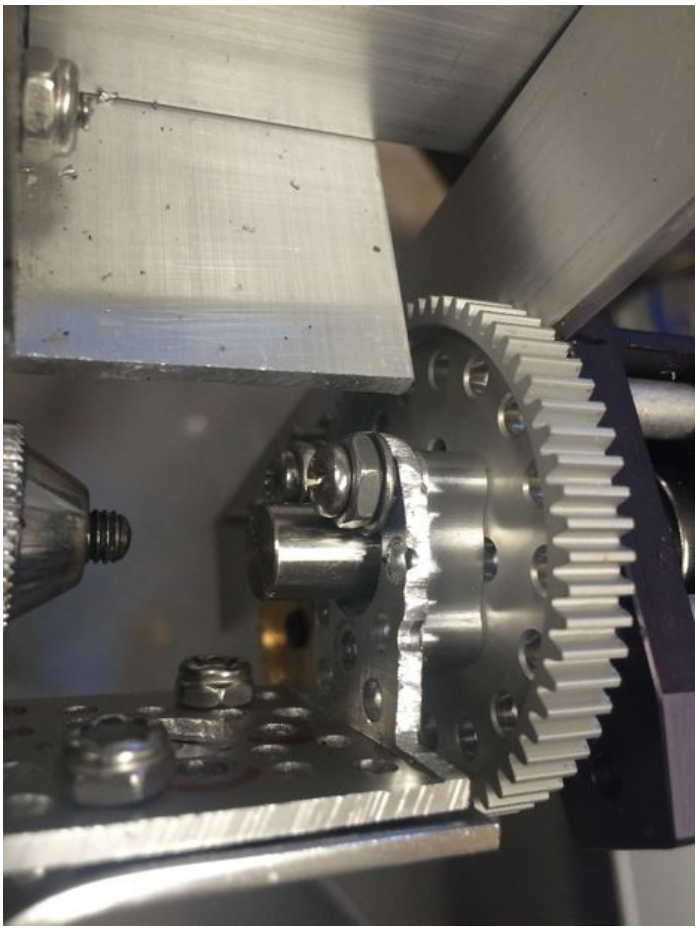
Take an angle grinder and cut off the rear triangle off the bike. Remove all loose bike parts like the seat, bottom bracket, rear wheel, chain, chain rings and brakes and such. I went for a clean look but if you want to festoon your heater with more of this stuff its ok. I took it down to the frame and ground off all the paint and rust with a sander. It is probably a good time to rebuild the Headset bearing as this needs to be functional and smooth for the servo to operate. If its an old rusted out mess you can still get it working--just follow the YouTube videos on how to do this. Remove the front wheel hub and strip off all the spokes and wheel. Rebuild this bearing too. Save some of the parts for repainting and remounting later--I used the brake levers and ornamental gear shifters.

The bike is mounted eventually with the seat tube parallel to a wall surface which causes the head tube to hang vertically too--the two are usually parallel. This is important in getting the servos into a rest position so they don't have to fight gravity and uneven pulling. I drilled some holes through the seat seat tube and with some washer adjustment to a aluminum mounting plate that holds it securely. It is cantilevered out quite a distance so this wall attachment has to be robust.



Step 3: Build attachments for servos

The upper servo attachment was pretty easy. After rebuilding the head tube it was easy to through bolt the stem screw that attached the handlebars on and use it as an attachment point for the servo connection. The Servoblock from ServoCity has many ways of adapting the servo drive interface with secure aluminum machined clamps that accommodate different sizes of aluminum stock pipe. The housing was attached to a set of custom made aluminum angle bars that were attached to an aluminum channel that was bolted directly to the top tube. When using servos it is very important that the alignment be very accurate so that binding does not occur at some point in the excursion and stress the servo. The lower servo--the beefier of the two was also easily accommodated with bolted attachment of angled aluminum to the lower fork. The rotation of the servo must be concentric with the movement of the front wheel rotor bearing.

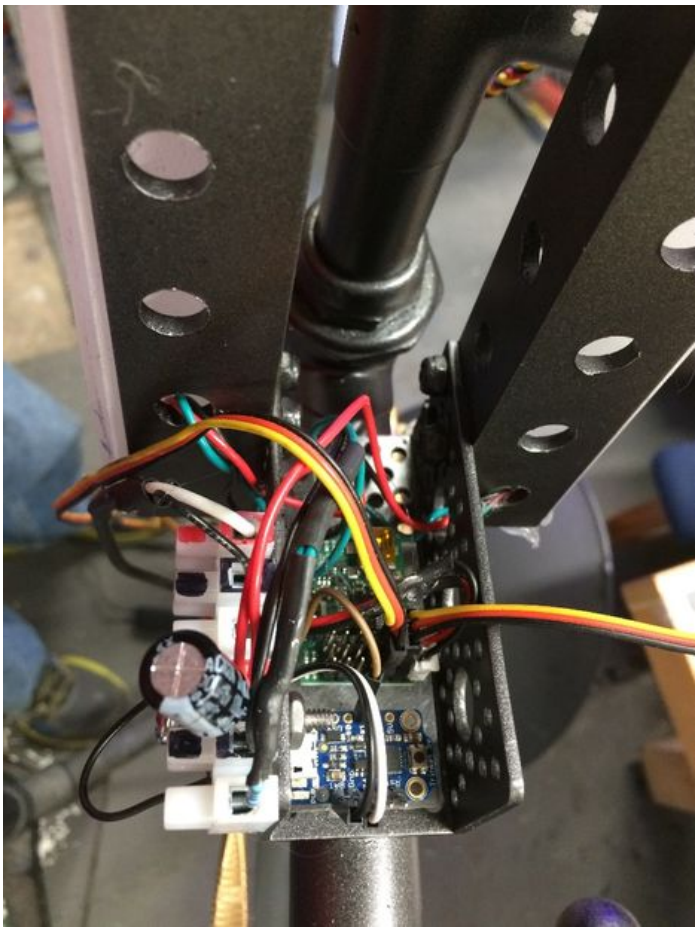


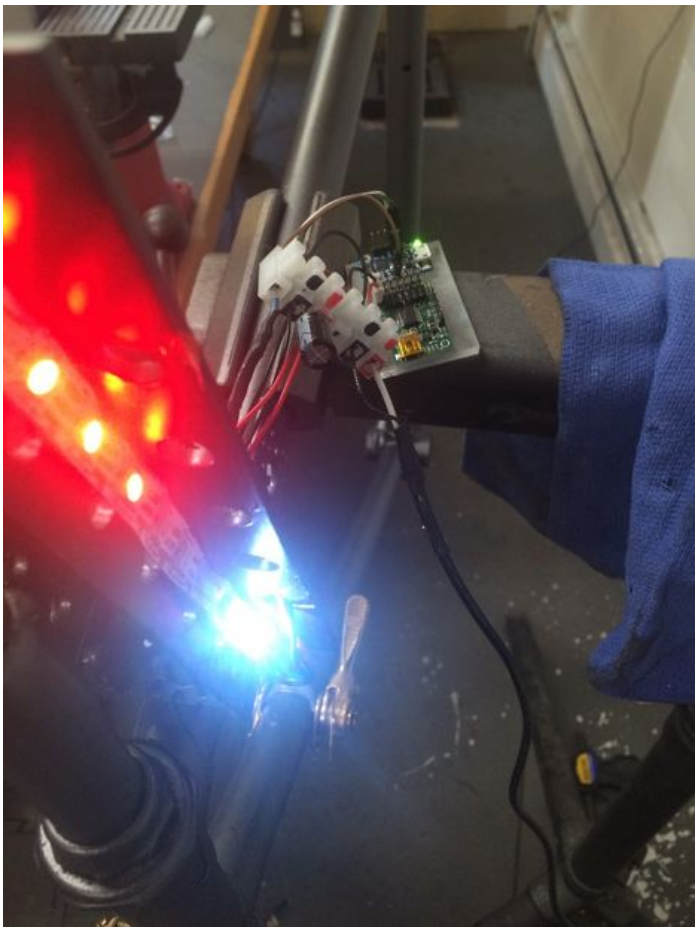
Step 4: Build the heater

Tear apart the Presto heater until you get to the raw shell as illustrated. All plastic and control wiring should be removed along with the wire spider screen that goes over the face of the reflector. The unit is going to be mounted on the front of the wheel bearing axel and has to be counterweighted so that it rotates up and down freely without putting undo strain on the servo. For this reason you want to minimize the cantilevered weight of the reflector. I found that if you mount the weight of the unit onto one attachment point on the bearing and balance it with a counterweight attached exactly opposite at one point -- in this case made up of heavy washers the wheel will rotate reasonably well without too much cocking due to the uneven shapes that are moving. This is again to insure that there will be minimal stress on the servo. Check the balance multiple times by adding and subtracting washers until the unit is stable.

Step 5: Electrical and accoutrements

You will need servo extension wires to reach the Pololu Servo controller that you can mount on the top tube. You need DC 6 v 2 amps auxiliary power supply to run the servos which can be run along the top tube. You can also use this to power the ProTrinket to run the NeoPixels for the decorative fires running up above the handlebars. I covered these neopixel festooned struts with sandblasted plexiglass to diffuse the light effects from the LED's. The fritzing diagram is included. The wiring to the radiant heater is a simple 16g lamp cord run along the fork and over the top. You can use a Arduino NeoPixel program for the fire effect -- these are readily available on the web.





File Downloads

cycloradiant.pdf (787 KB)
[NOTE: When saving, if you see .tmp as the file ext, rename it to 'cycloradiant.pdf']

Step 6: Using it for good

The new targeting software from Realsentrygun.com works great with Windows 10--a few hints: slow down the servos response to low, use a wide angle web cam and avoid putting any piece of the moving bike frame in the view. The Pololu board connects via USB to the laptop running the software--you can use a really cheap machine for this. Surprisingly the heater power can be felt a good twelve feet away so it really does provide a strange good sense of warmth whenever it targets you. This is obviously not a final solution for targeted indoor heating, but thinking along the lines of integrated micro environments that can be individually tuned for occupants rather than wholesale basting with hot air makes good sense and will be exploited in the future.

Related Instructables

HeaterMeter Pit Probe by daveselinger

Andee Sentry Gun with Annikken Andee by Annikken

Robotic Spider V8 by FoamboardRC

Spacebrewer - Remote Tea Making Device by AdielFernandez

Control Servos with Arduino and RC Receiver/Transmi by Michalsky

BIKEDUINO::: Stopping Point Predictor for bike riders by axpirina

Comments