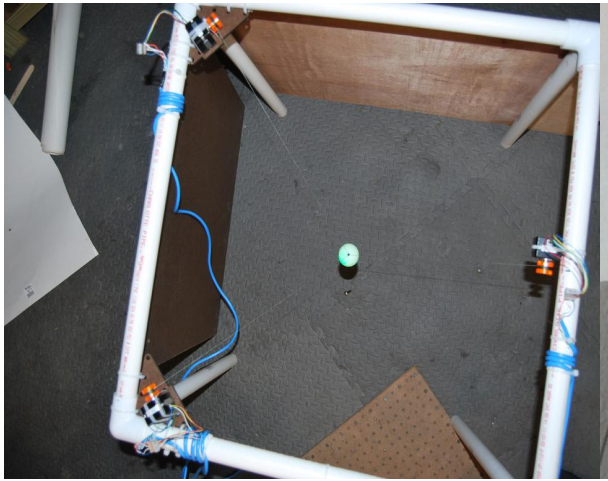
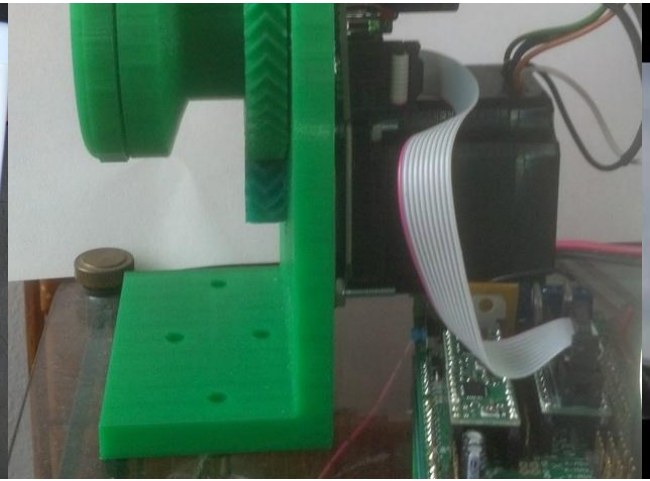
WireBots

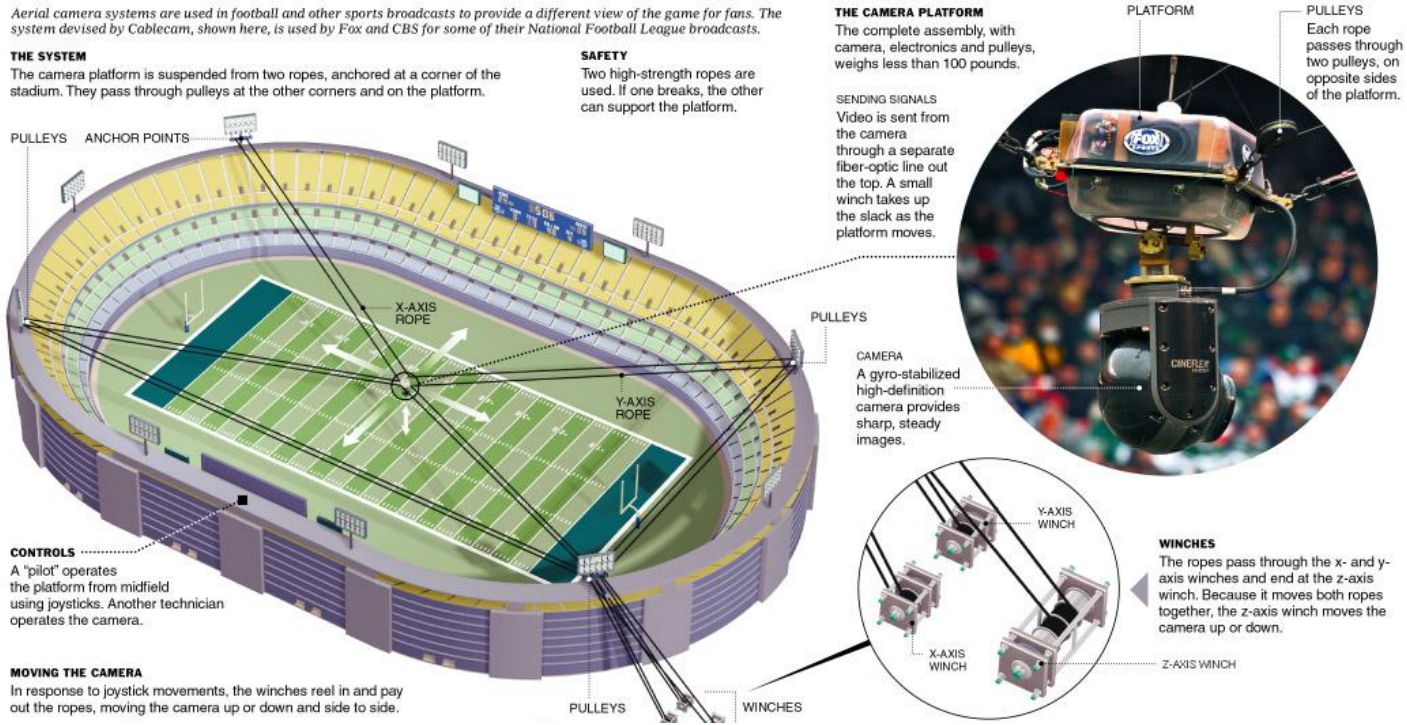
Bringing Large Scale Robotics to the "Reel" World at "Realsonable" Prices.





WireBots

One example is the SkyCam that sports stadiums use to fly video cameras over the field. Instead of moving inside the environment, the robot *incompases* and *surrounds* the environment.



The system is composed of 3 or 4 winches pulling cables that meet at the load point where the load (camera, etc…) "flies" over the area.

There are multiple advantages to this system, but the primary one is that: ***Positioning is easy; it goes where the cables allow it!***

Examples, Problems, Solutions:

2D Cable Bot CNC Router:
https://www.maslowcnc.com/

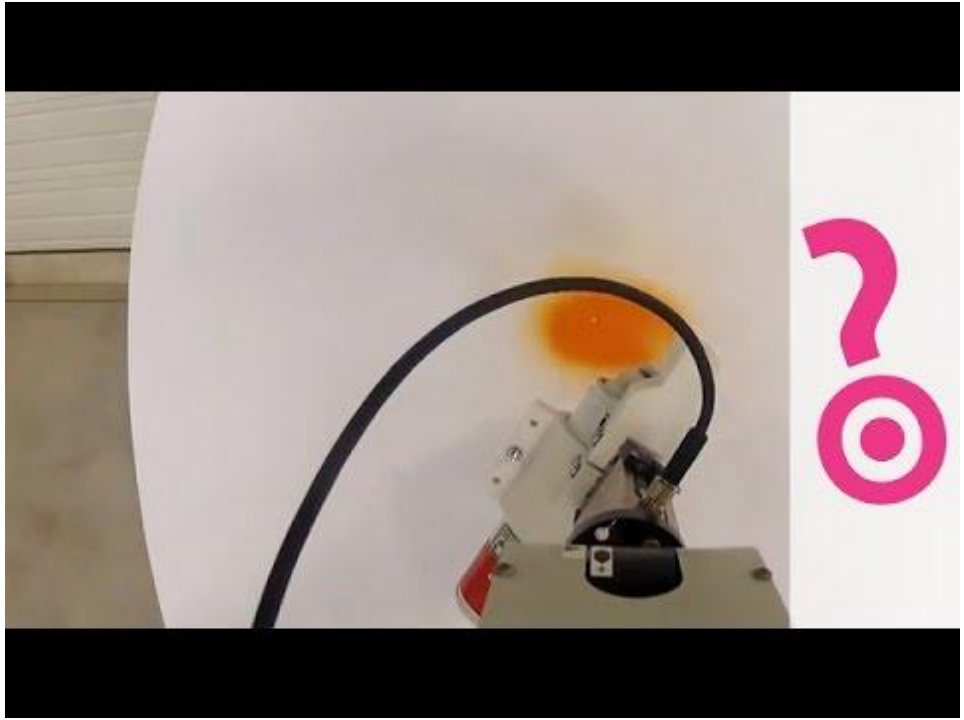
How to make a winch? For a room sized bot:
https://hackaday.io/project/166527-cable-robot

How to stabilize the load point?
SkyDelta 2, with springs and tilting pole, load platform stays horizontal: (discussion)
https://reprap.org/wiki/TriDPrinting.com_Flying_SkyDelta

Arcus C1, tricky cables, "virtual" pulleys,
https://hackaday.io/project/26938-arcus-3d-c1-cable-3d-printer

Use an overhead point via ceiling or crane,
https://3dprintingindustry.com/news/open-source-advocates-ornls-skybaam-3d-printer-copying-earlier-hangprinter-technology-203278/

How to do the Maths?
Keep the poles consistent and use delta firmware, or:
Automatic calibration:
http://www.iaacblog.com/programs/machine-learning-autocalibration/
https://github.com/luigipacheco/CRA



Higher Heights

An excellent solution to the issue of printing height: Add a tensioning point via a crane, or pulley on the ceiling when used inside.

https://3dprintingindustry.com/news/ornl-gains-patent-for-skybaam-cable-hoisted-construction-3d-printing-technology-203113/

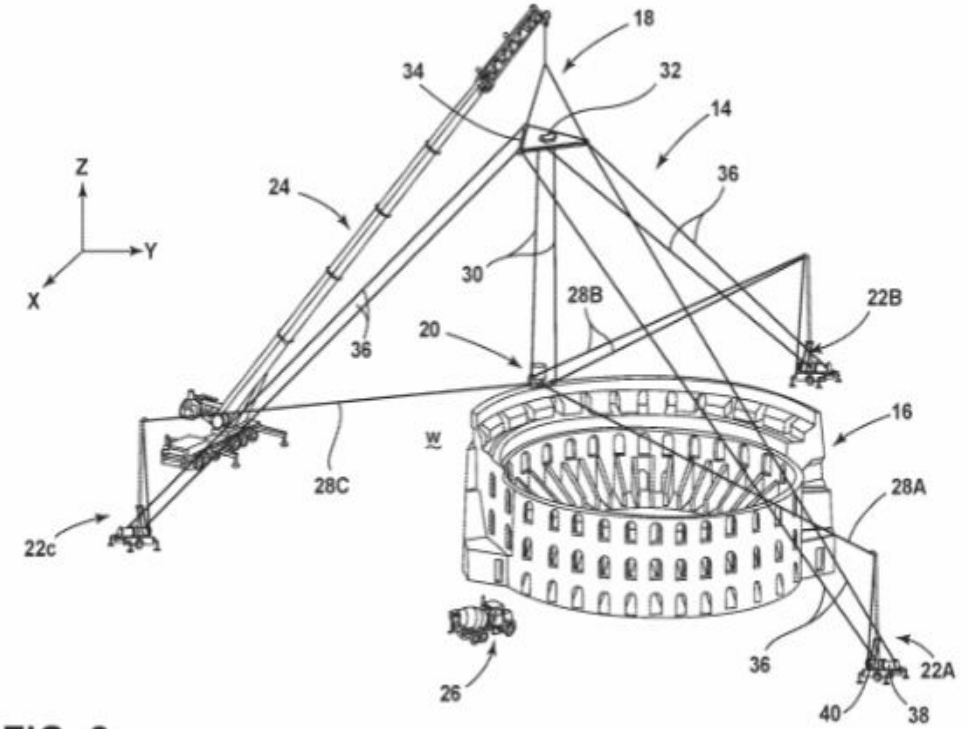


FIG. 2

Use Cases

Very large 3D Printers:

3D printing homes and other structures works better when you can cover a larger area at lower cost.

Automated/Telepresence Backyard Gardening:

The ultimate in local-vore food production, for busy people without the need for a green anything.

Very Low Cost Room Sized Robots:

Every young roboticists dream; A robot easily programmed to pick up your room.

Large Scale Area "SkyCam" and Delivery:

Delivering the promise of Airborne delivery which UAVs can not provide safely nor reliably.

Educational Real World D&D:

Promoting Open Source Programming through Game Play at Maker Faire

Large Scale 3D Printing

Gantry type (XYZ) house printers are becoming common. MassMind has helped two such systems get started by providing low cost high power stepper motor drivers:

http://massmind.ecomorder.com/Techref/io/stepper/THB6064/gallery.htm

Wirebots can cover a larger area at lower cost.

Contact JamesNewton@MassMind.org for next steps.

Automated/Telepresence Backyard Gardening^:

The ultimate in local-vore food production, for busy people without the need for a green anything.

A simple robot hanging above a garden on three poles that can "fly" over the plants taking pictures for remote review and to build up a daily record of growth and the leadup to problems. With pogo pins, probing the soil for moisture level. If fitted with a gripper or something like the "Awesome Auger^" it could remove weeds, dig small holes to plant seeds, etc… At night, or when not working, the unit could park at high center, and watch for movement; running off any animals, birds, etc…

If needed, the instability of the wirebot head can be improved by running *two* wires from the head to each pole, one high and one low holding the head top and bottom.

This could be combined with a social website that shows an overhead picture of your garden and invites people to play a "game" of nuking your weeds, complete with CGI explosions of the targets. The aggregate result, less protected areas where you know there are plants, can direct the robot to weed the area.

Data collected can be shared with experts via the internet. ^ ^

A motorized winch was developed at: http://www.thingiverse.com/thing:161157 and used for proof of concept. The next step is larger winches and an outdoor installation with poles. Contact JamesNewton@MassMind.org

Very Low Cost Room Sized Robots:

Every young roboticists dream; A robot easily programmed to pick up your room.

The system cost is low enough that a slightly smaller, "room sized" version could easily be made / kitted for students who wish to implement a robot that can affect an entire room and be programmed easily. No positioning errors means that there is no need for sensor feedback. A simple claw on the mount can be programmed to go to each square foot of the floor, pick up any object that might have been thrown there :ahem: and transport it to a suitable destination such as a laundry hamper. More advanced systems could use a laptop webcam to identify and sort objects retrieved.

The basic system is just 3 stepper motors and drivers with kite string wrapped around the shafts. Small NEMA 17 motors and $10 Pololu drivers with an Arduino controller and old network or phone cords to connect everything (low voltage). Almost any 12 volt wall wart can supply enough power.

Start with a coat hanger claw, then move up to a servo actuated version.

Adding on different end effectors, sensors, or tools could open a wide range of learning opportunities in the field of automation.

Large Scale Area "SkyCam" and Delivery:

Delivering the promise of Airborne delivery which UAV's can not provide safely or reliably.

Skycam is a computer-controlled, stabilized, cable-suspended camera system. The system is maneuvered through three dimensions in the open space over a playing area of a stadium or arena by computer-controlled cable-drive system. It is responsible for bringing video game-like camera angles to television sports coverage. The camera package weighs less than 14 kg (30.86 lbs) and can travel at 13 m/s (29.08 mph).

Invented by Garrett Brown (also the inventor of the Steadicam),[1] "Skycam" is a trademarked name. However, with the expiration of the original patents, other companies have entered the market, and the term "Skycam" is used generically for any cable-controlled camera system.

Delivery of product, food, snacks, or anything inside a large hall or event field could be automated and traffic avoided.

Educational Real World D&D:

Promoting Open Source Programming through Game Play at Maker Faire

Users (kids of all ages) at a Maker Faire, make an "avatar" (can be anything, a bionicle, fairy doll, small stuffed animal, etc…) and it is attached (magnet?) to an overhead actuator which moves it through a maze. A camera above the maze shows the avatars progress and a camera just above the avatar provides an "over the shoulder" shot from the avatars point of view.

The actuator is controlled by an Arduino "sketch" which is easily written with keywords like "left()", "right()", "back()" and so on to move the avatar through the maze. There are no cumulative positioning errors (common with wheeled robots) greatly simplifying the required programming.

If the avatar touches anything, a switch in the mount to the actuator is triggered and "game over". The avatar is then returned to the starting point. The user can edit their program and try again.

As the user writes the instructions to move the avatar through the maze, they have the option of saving it in a shared folder. When the users turn is up, that saved version is available:
a. for them on their next turn
b. for other users to take as a starting point

This enforced code sharing points out the benefits of open source development and teaches users to contribute to a group project.

Educational Real World D&D: (cont)

Promoting Open Source Programming through Game Play at Maker Faire (cont)

In addition to the operation by user at the faire teaching open source, the project itself provides many paths to bring together open source makers.

MAZE: The maze can be made from interlocking blocks or boxes which follow a defined size and pattern. Each block can be built individually in any material and can incorporate any feature imaginable, including:

1. Moving barriers, "trap doors" or other elements which are activated by the avatar.
2. Any block might be a "wormhole" or portmanteau which transports the avatar to another location.
3. More extreme options are possible, including circular saws, fire, or other destructive (fun) things.

NPCs: Non Player Characters can be provided by standard maze running robots.

AR: Augmented Reality can be incorporated in the form of changes made to the overhead or POV camera video feeds which can also feed back into the system control. E.g. a virtual airstrike from a paper rocket can be detected and an explosion added to the video, resulting in a "game over".