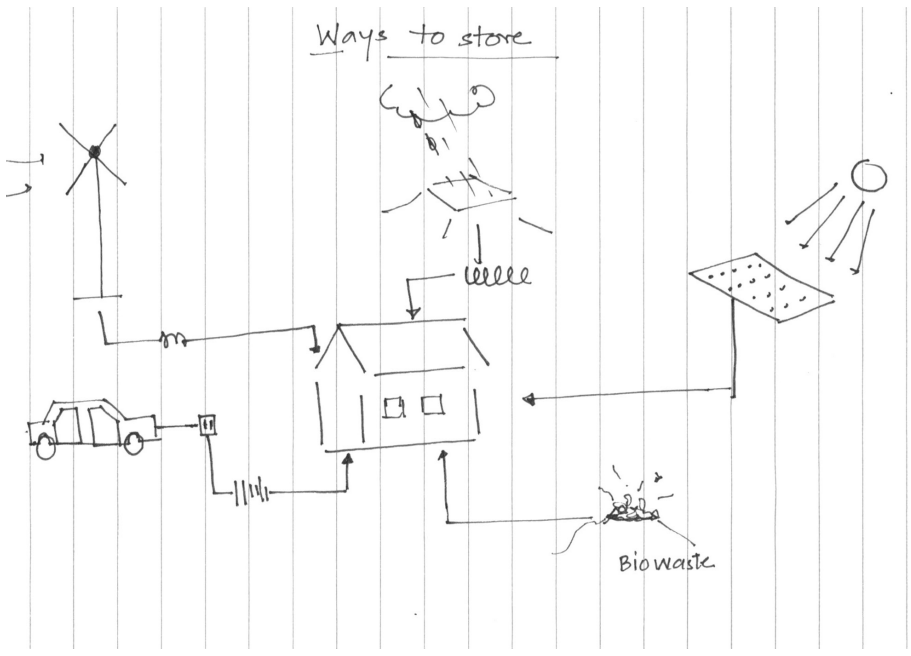
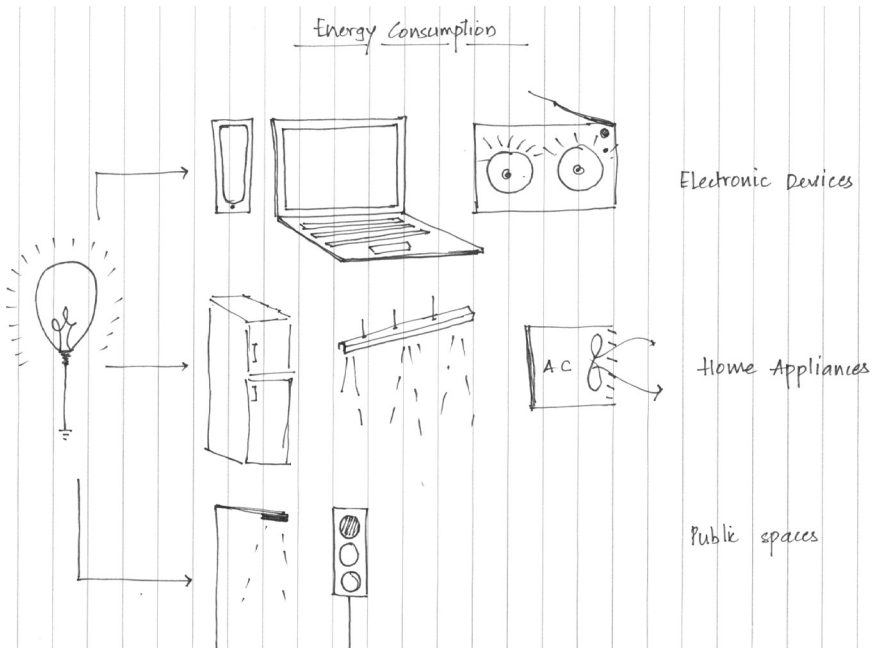
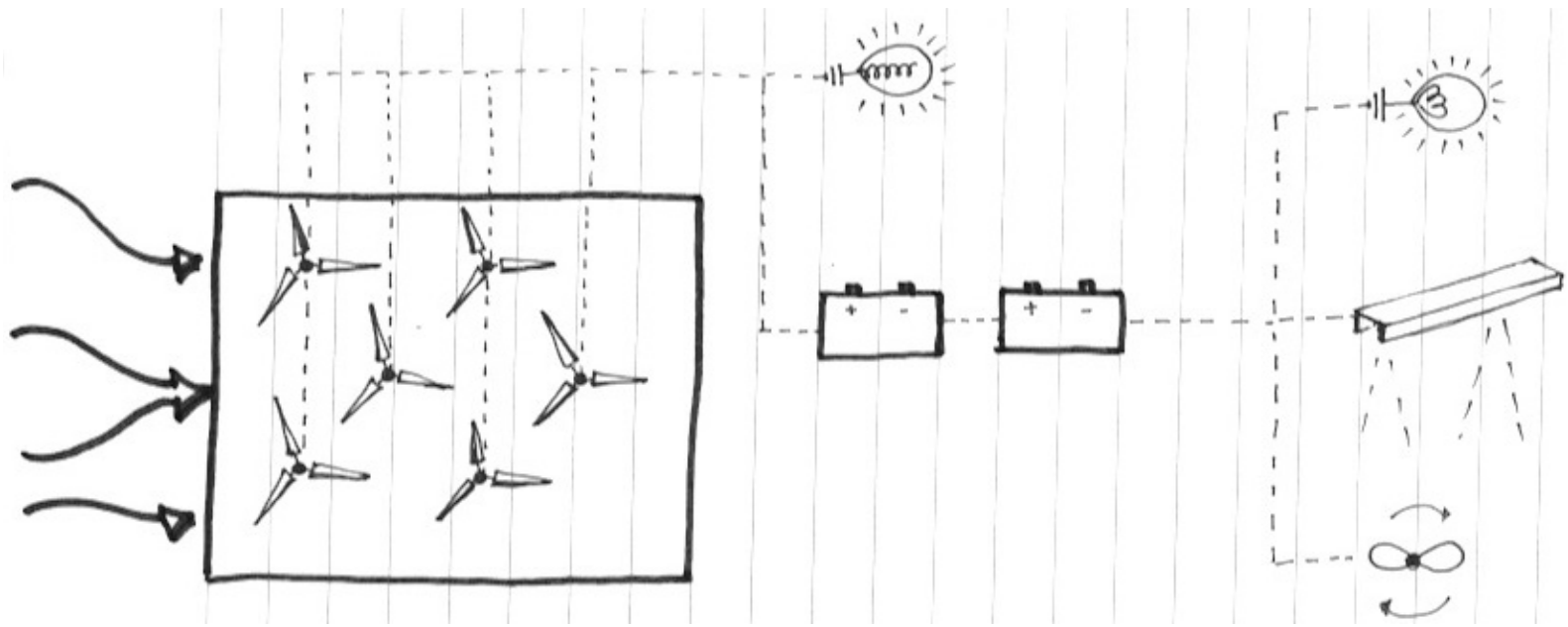
bright breezes

Germania Garzon
Ruchita Chandsarkar
Marcus Royes

concept & idea







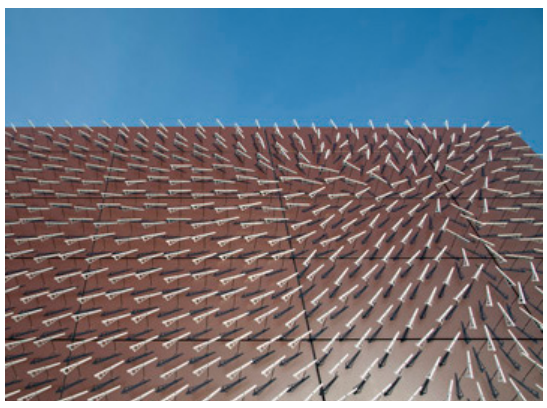
research & precedents

Daan Roosegaarde

- “smart highway”

- fans with small LED lights would light up with breeze from a passing car

- conserves energy and uses light only when needed



Charles Sowers

- “windswept”

- ornamental weather vane

- hundreds of rotation devices which indicates the wind’s direction

Prof. J. Meejin Yoon

- “FAST Light”

- light installation wall at MIT in 2011

- turbines spin and use their own power to light green LEDs

- each turbine is made from recycled material

Chad Oppenheim Architecture and Design, Buro Happold, Ysreal Seinuk

- “The COR Building”

- highrise tower in Miami, Design District

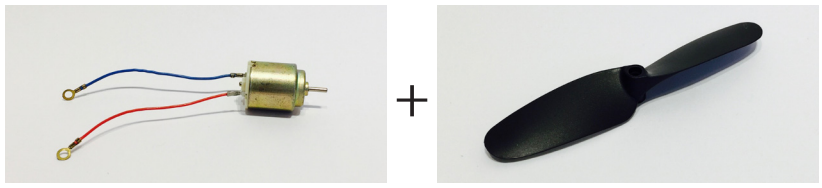
- energy efficient

- wind power strategy

- solar power strategy in windows

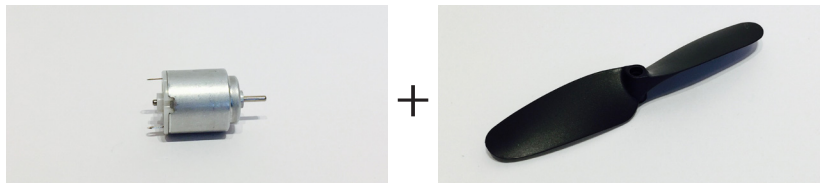
- solar shading stretegy in windows

motor research & data



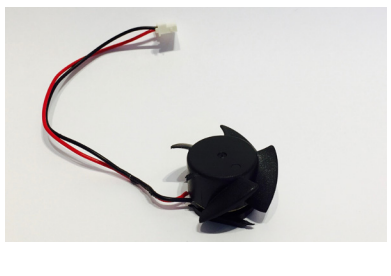
12 v DC motor - brushed - wired

- no response to natural wind
- minimal response to fan
- successful response to blowdryer
- max V produced 1.1 - 1.2 V



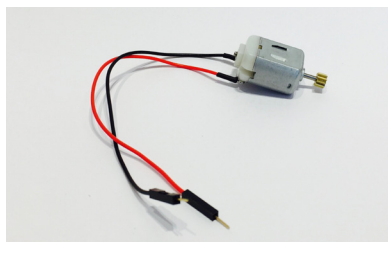
12 v DC motor - brushless - no wires

- no response to natural wind
- semi- responsive to fan
- successful response to blowdryer
- max V produced 1.1 V



24 v magnetic DC motor - brushless - wired

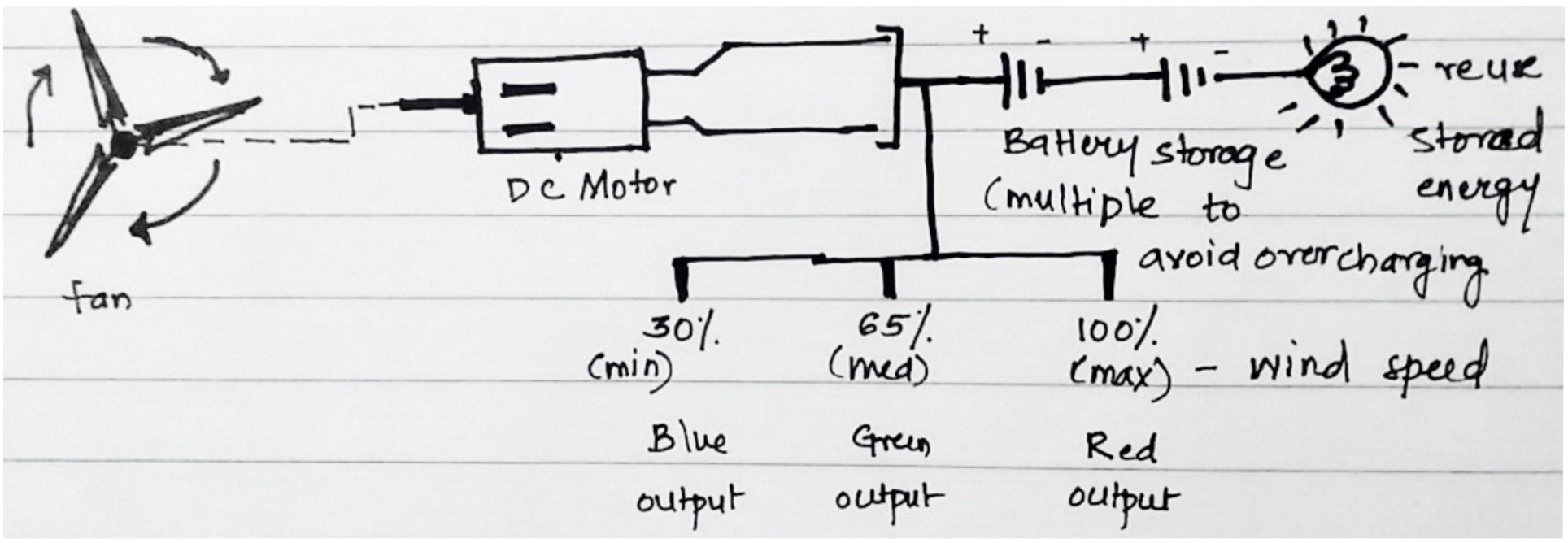
- no response to natural wind
- no response to fan
- no response to blowdryer
- failure - no V produced

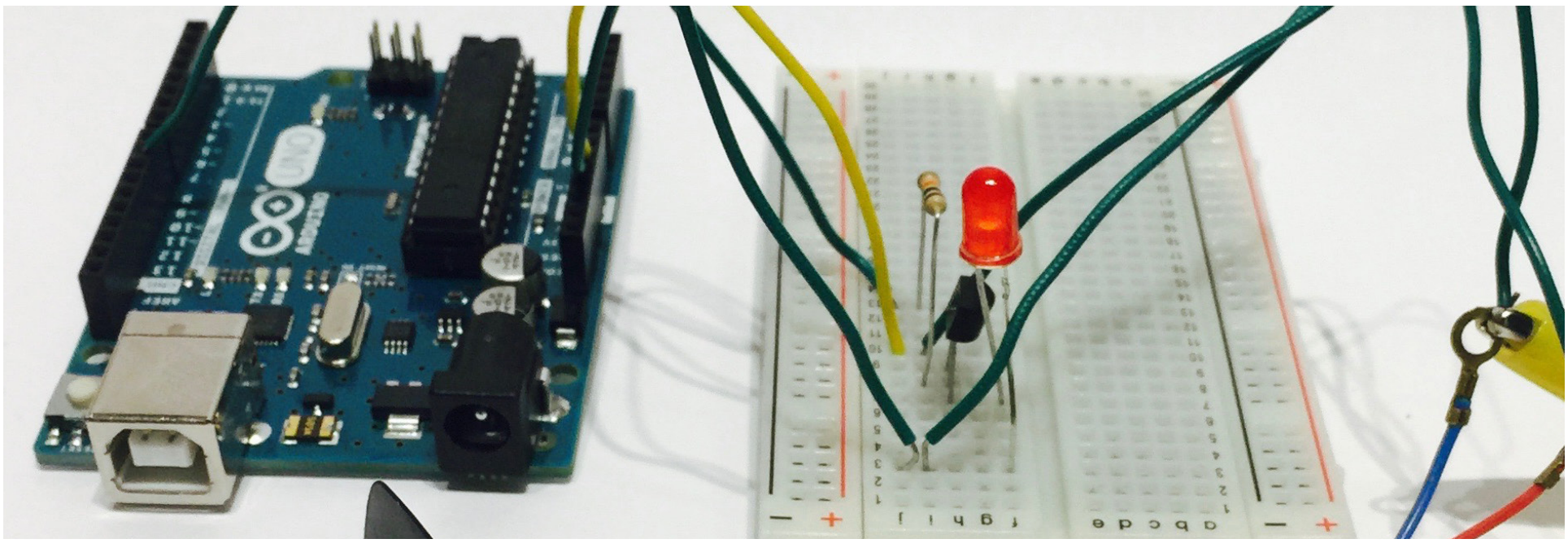


12 v geared DC motor - brushless - wired

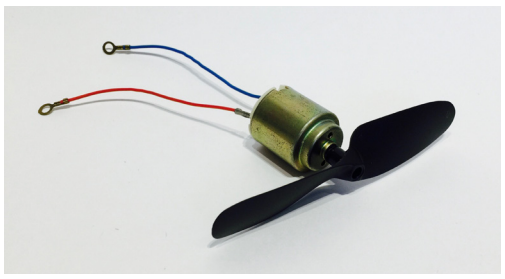
- no blade that would fit the gear
- no response to natural wind
- no response to fan
- no response to blowdryer
- failure - no V produced

circuit diagram



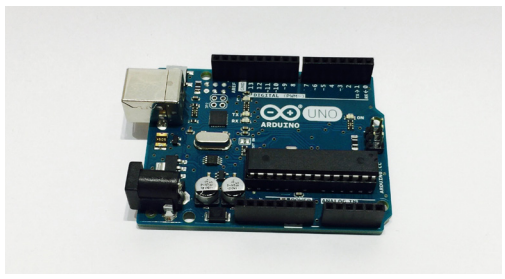


1st prototype materials & test



12 v DC motor - brushed - wired

+



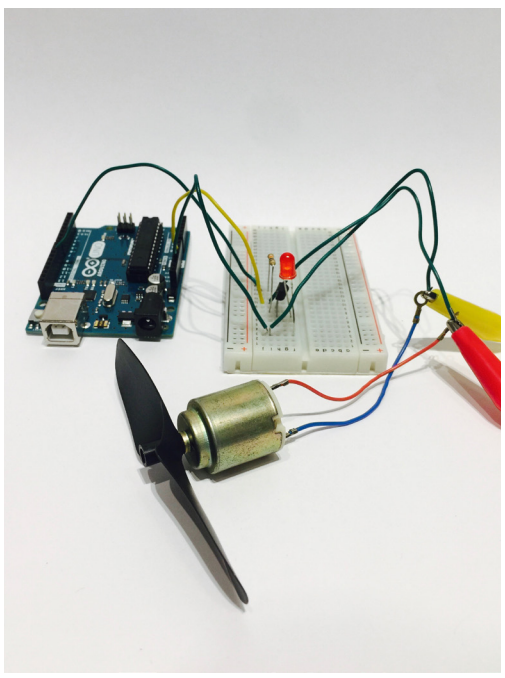
arduino uno

+

red LED

+

transistor



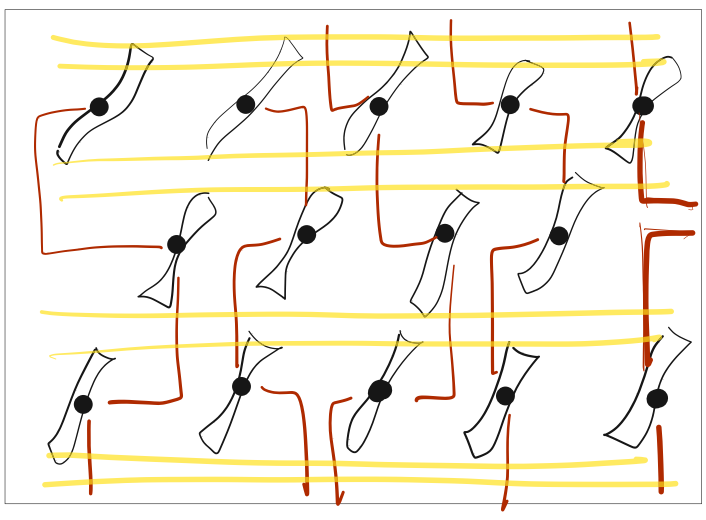
- no specific manual control of fan speed

- LED response was dim

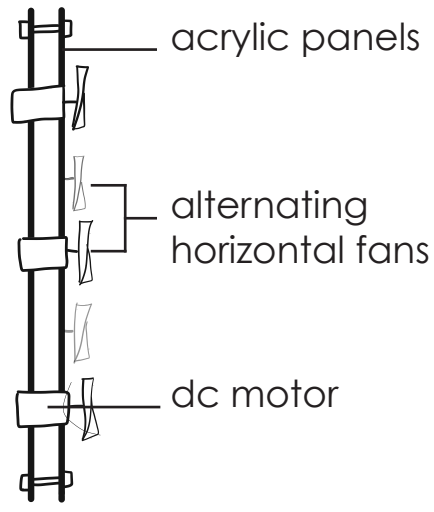
- surged brighter with added wind speed

- produced a range of voltage between 1.1v - 1.2v

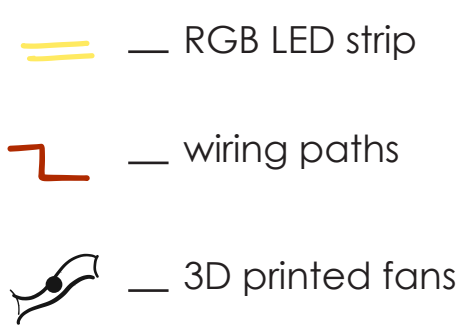
2nd & 3rd prototype concept diagrams



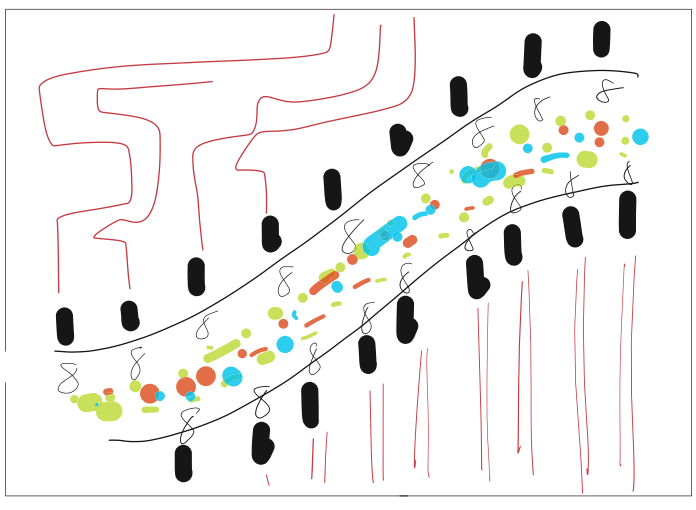
front view



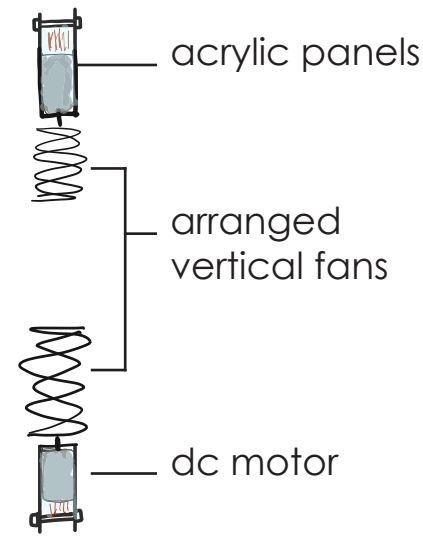
section



details



front view



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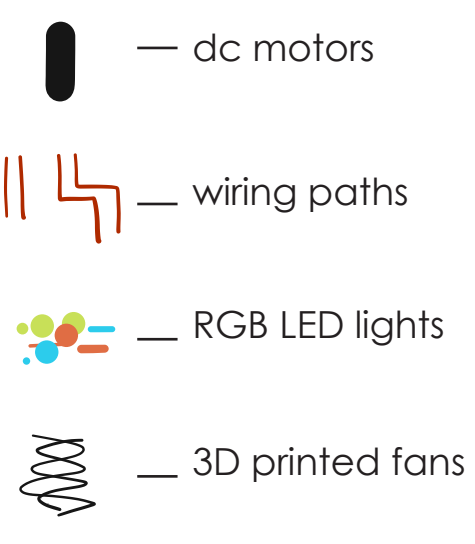


details

research for 3D printed horizontal & vertical blade designs

horizontal blades

- flat blades = oldest blade design & becoming less common

- flat blade rotation = very slow

- curved blades resemble aeroplane = "aerofoil"

- air moves over the top of a curved blade faster than it does on the underside & creates low pressure area on top, lifting forces & faster movement

- the faster the wind blows the more lift is produced, the faster the blade moves

- all blades suffer from "drag force" which can be lessened by bending or twisting the blade

source: *alternative-energy-tutorials.com*

vertical blades

- Can produce eletricity from wind in any direction

- Lower risks for humans & animals

- Easier installation compared to HAWT

- Can be installed in urban or extreme weather areas

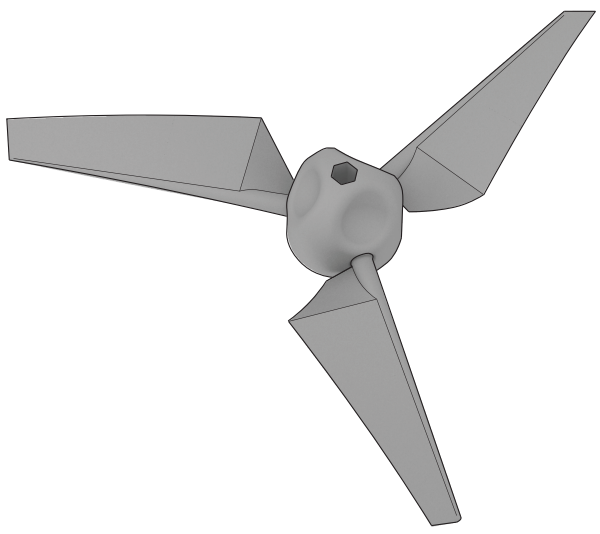
- Low maintenance/ easier to transport

- Gearbox, generator, etc., placed in ground to reduce the weight of the supporting tower

- Can produce energy from lower wind speeds, so it can be placed lower to the ground

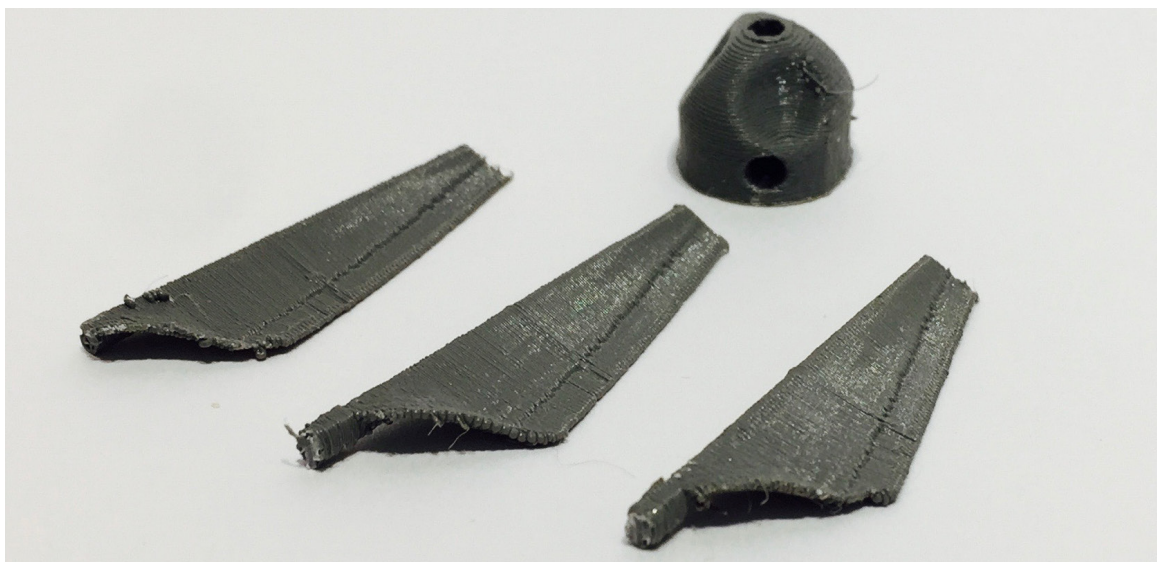
source: *green-machine.com*

3D models & test prints

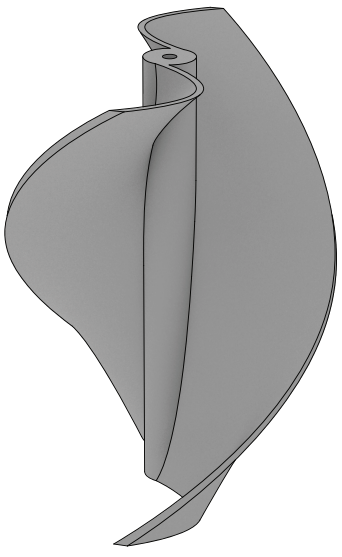


horizontal blade 3D model

"remix" of #catchthewind by plaszlonet on thingiverse.com



printed vertically as separate pieces - failure - too weak/innacurate assembly



vertical blade 3D model

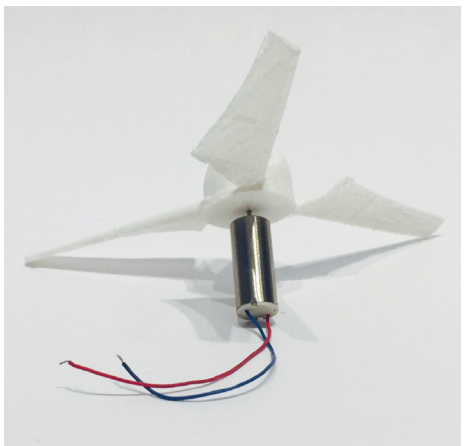
"remix" of VAWT by Robotobi on thingiverse.com

printed vertically as one piece - successful

2nd & 3rd prototype materials & test

horizontal turbine

& 3.4V dc coreless motor + 3D printed horizontal blade + arduino uno



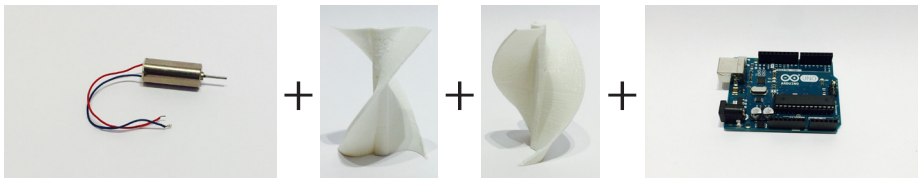
- no specific manual control of fan speed

- LED response - dim to none

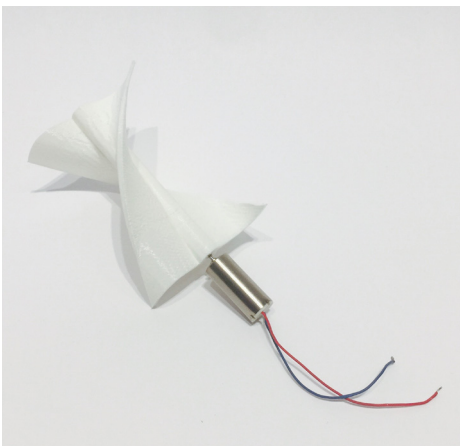
- surged brighter with added wind speed

- produced a range of voltage between .08 - .1 v

vertical turbine



& 3.4V dc coreless motor + 3D printed vertical blade + arduino uno



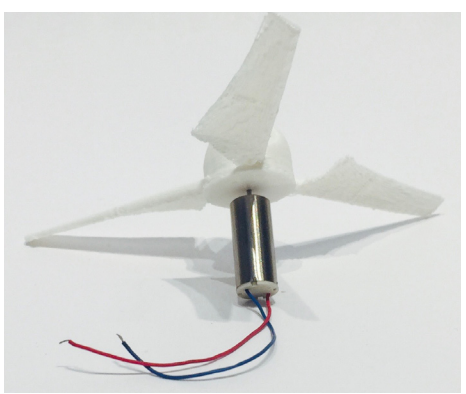
- no specific manual control of fan speed

- LED response - dim to none

- surged brighter with added wind speed

- produced a range of voltage between .1 - .11 v

short-comings & future possibilties



x 12

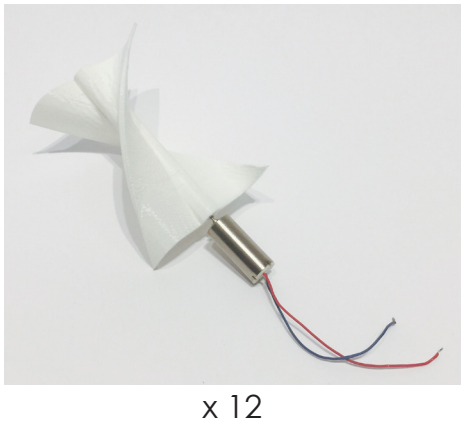
=

- horizontal blade prototype & 3.4V dc coreless motor produces about 1/10 of a volt according to multimeter (.08 - .1v)

- 1 LED needs about 1.9v to light

- fans are tiny and wires are not too reliable

- would need about 30 to light an LED, hundres to light multiple LEDs



x 12

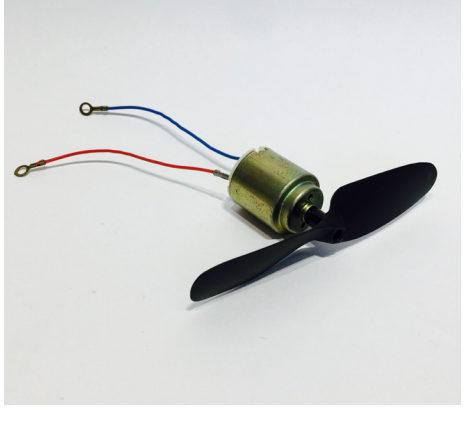
=

- vertical blade prototype & & 3.4V dc coreless motor produces about 1/10 of a volt according to multimeter (.1 - .11v)

- 1 LED needs about 1.9v to light

- fans are tiny and wires are not too reliable

- would need about 25 to light an LED, hundres to light multiple LEDs



OR

- vertical propeller with 12V DC brushed motor

- replace tiny 3.4V dc motor with 12V dc motors

- 1 can produce almost enough energy to power a single LED (1 - 1.1V at a time)

- 12 of these could potentially light an LED strip