Design Evolution

# Prototype 1: Hand-held Roller

Designed as an initial test for rolling a cable into the sample wall. Was designed to be spring loaded and hand-held. For 10mm stranded cable. CAD models were deleted.

Design was abandoned in favour of a robot-mounted one.

## Advantages:

* Concave wheel profile

## Issues:

* Requires large downwards force
* Requires many elastic bands
* Prone to slipping
* Difficulty with corners

# Prototype 2: Crank Feeder

Designed for no contact to the sample wall, just to feed the cable with enough force to press-fit. Hand-cranked for 10mm stranded cable. CAD models were deleted.

Design was abandoned.

## Advantages:

* Concave wheel profile
* No contact/wear with wall

## Issues:

* Requires large grip force
* Prone to slipping
* Push-fit depth is unpredictable
* Prone to cable raising after routing
* Design tolerances were too big
* Hand cranked

# Prototype 3: Framed Roller Initial

Designed for robust routing and lowered variability. A series of wheels would align then press the cable into the channel. For 12mm solid cable.

## Advantages:

* Concave wheel profile
* Robust routing method

## Issues:

* Hole-edge distance too small
* Structure is too thin and flimsy
* Not enough holes for arm mounting
* Feeding hole didn’t work
* No stepper

# Prototype 4: Framed Roller Iteration 1

Iteration of previous prototype. For 12mm solid cable. Some CAD files altered and no renders.

## Advantages:

* Concave wheel profile
* Robust routing method
* Increased thickness of structure (including hole-edge distance)
* Better arm mounting holes
* Replaced feeding hole with roller

## Issues:

* No Stepper
* Arm mounting holes don’t fit screws

# Prototype 5: Framed Roller Iteration 2

Iteration of previous prototype. For 10mm stranded cable for better performance. All CAD files altered and no renders.

## Advantages:

* Concave wheel profile
* Robust routing method
* Increased thickness of structure (including hole-edge distance)
* Replaced feeding roller with a stepper motor driven feeding mechanism

## Issues:

* Loaded feed wheel doesn’t close enough
* Stepper mount screws stick out too much
* Stepper mount screws are incorrectly positioned
* Arm mounting holes don’t fit screws
* Driven wheel isn’t supported opposite stepper properly - screw doesn’t thread into anything
* Feed wheels sometime slip

# Prototype 6: Framed Roller Final Iteration

Iteration of previous prototype. For 10mm stranded cable.

## Advantages:

* Concave wheel profile
* Robust routing method
* Increased thickness of structure (including hole-edge distance)
* Replaced feeding roller with a stepper motor driven feeding mechanism
* Increased movement on loaded wheel
* Bored and rearranged stepper mount screws
* Changed arm mounting to dovetail mount with extra piece
* Inserted screw “key” opposite stepper on driven wheel

## Issues:

* Feed wheels sometime slip
* Does not accommodate different cable sizes
* Stepper motor struggles (might just be making lots of noise)

# General Sketches

Workbook sketches which detail previous designs and iterations.

# Stepper Motor

Contains:

* Fritzing circuit diagram for the stepper motor
* Figure of circuit diagram
* Basic stepper motor control script
* Stepper motor circuit description