http://beautifuldecay.com/2012/09/05/alberto-tadiellos-kenetic-sculptures/

Merging High tech with Low tech

Special Project Report

Guided by **Prof P. Kumaresan**

Project by **Anand**

Declaration

The research work embodied in the written submission titled "Merging High Tech and Low Tech" has been carried out as Special Project by the undersigned as part of the post graduate program in the Industrial Design Centre, IIT Bombay, India under the supervision of Professor P. Kumaresan.

The undersigned hereby declares that this is an original work and has not been plagiarized in part or full from any source. Appropriate reference information or links have been provided wherever due. Furthermore, this work has not been submitted for any degree in this or any other University.

I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action if need arises.

Anand
126390003
Industrial Design Centre
Indian Institute of Technology, Bombay

Approval Sheet

This design project entitled "Merging High Tech and Low Tech" by Anand, 126390003, is approved in partial fulfilment of the requirements for Master of Design Degree in Mobility & Vehicle Design.

Project Guide

Date

Acknowledgement

I would like to express my sincere gratitude to Professor P. Kumaresan for his support and guidance. Without his constant efforts of trying to push me to find a purpose for the project, this wouldn't have been the same.

I am obliged to many of my friends who supported me, at various stages during the process of making this happen. The project wouldn't have been same without them. I would also like to thank Industrial Design Centre, IIT Bombay for providing me with all the facilities and necessary materials and an environment that encourage me to work on such a challenging project.

Anand
02th June 2014

Contents

Abstract

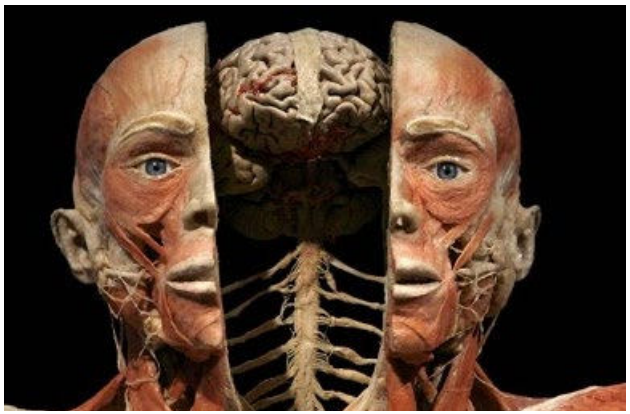
Merging Hight tech and Low tech materials is like collaborating two traditions.
The focus is to integrate highly optimized technology with low tech products in an efficient and effective manner. My project focuses on coming up with a FM radio in which the FM receiver circuit is open without any external form covering it. The project research ponders the following questions.
Do we need a packaging cover design which encloses the functional elements?
Is it possible to add aesthetic value to the radio just by showcasing the internal circuits without any external case desgin?
Can the visual form be defined by the functional elements of the electronic circuit and still make the radio aesthetecally appealing?
Is it possible to place the functional circuit elements in 3D space rather than a 2D printed board?

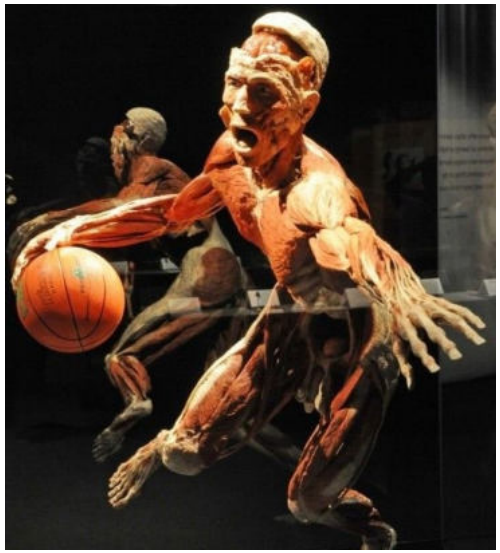
Introduction

http://osk.openkhm.de/

The project is about investigating, exploring and understanding existing electronic circuitry and explores possible ways to fuse technology and form.
Does any electronic device need an external casing over the circuitry ? Is it possible to achieve the aesthetic intent without the external case? Can the elements of the circuit be arranged in such a way that it creates a form that is aesthetically appealing to the user ? How will the user interact in such cases? Can the crcuit be constructed in a 3d form rather than soldering it to a 2D PCB board? These are some of the questions that are pondered upon in the project.
Wit the advent of new technologies like 3D printing, it is possible to create visual forms out of functional elements itself which eliminates the need for parts which have only styling value in it. This project focusses on how a functional electronic circuit board can be arranged in a visual pattern without hampering its functionally and thus achieve the aesthetic emotion.

A basic FM radio circuit is taken for study as it involves basic electronic circuit elements and has user interactivit to it. The new circuits that use chips are not considered as it has less elements.





Gunther von Hagen's "Body Worlds" - a traveling exhibition, where on display are exposed human remains (bodies of all or only some authorities) which passed a special treatment to provide for their long-term preservation, is an example of showing how the inner functional elements also have an aesthetic intent of their own. In this art exhibition, the human body is showcased with its inner elemnts open visually showcasing the visual beauty of inner functioning form. The same approach can be used in product designs where the inner functional circuitry can be revealed to create new visul forms without affecting or adding to the functional aspect.

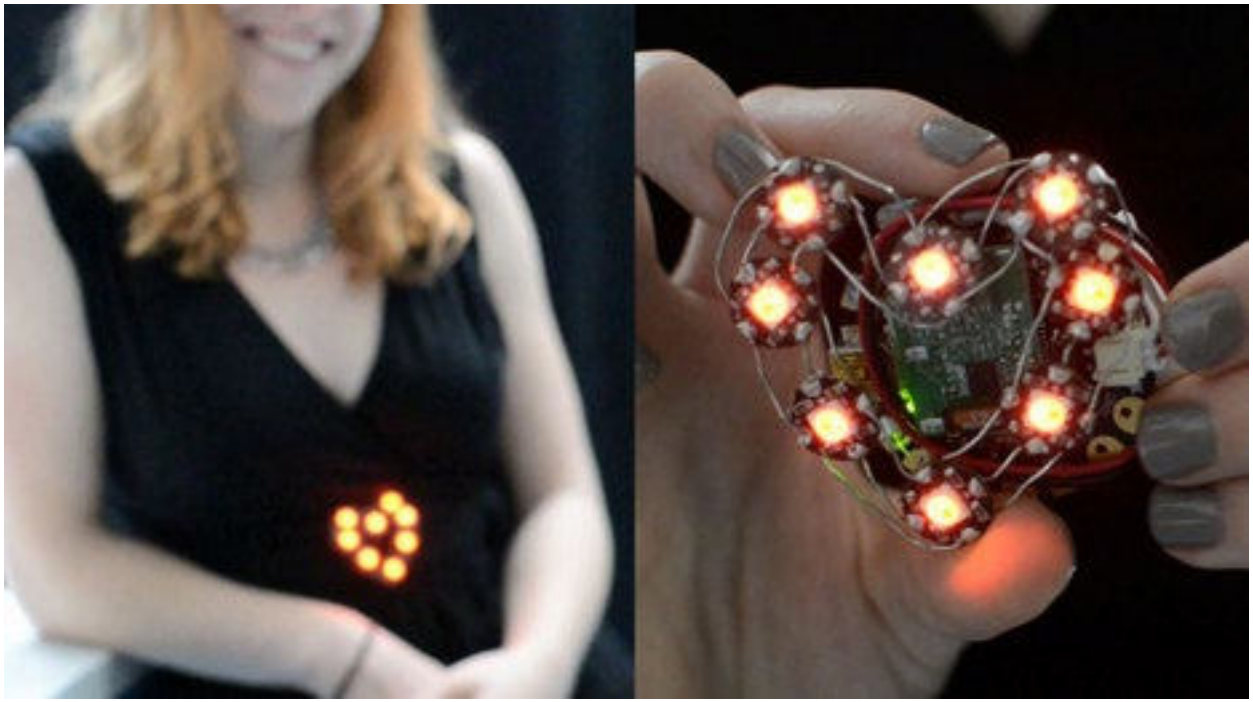
http://www.popgive.com/2010/12/worlds-body-exhibition.html

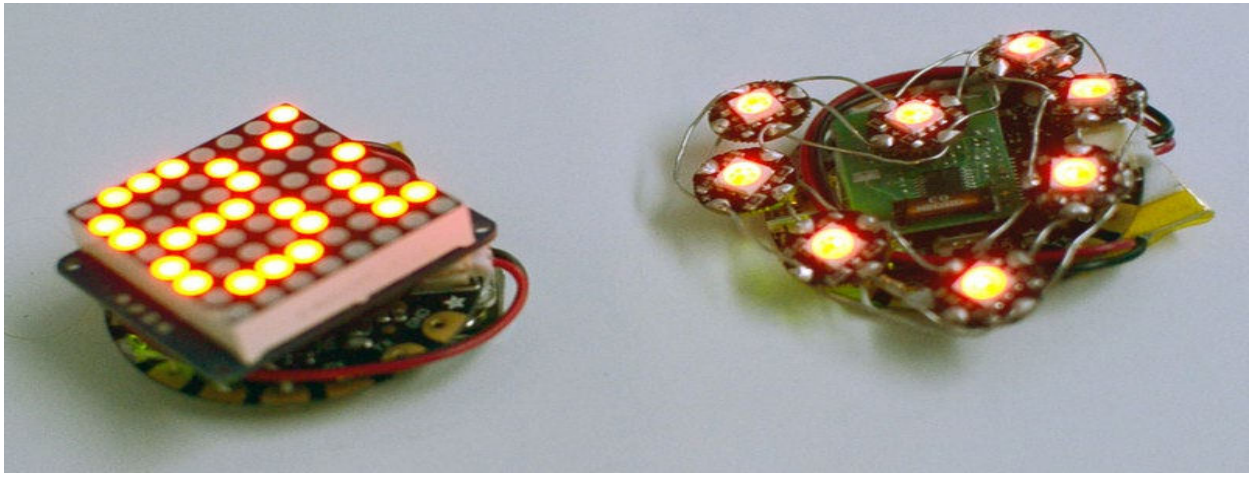
Primary Research

Open circuit designs

Flora - Wearable electronics

The concept of open circuit design is more seen in wearable electronic product these days where the circuit is not covered with any external form. In these cases, the form is dictated by the arrangement and schematic of the circuit itself .

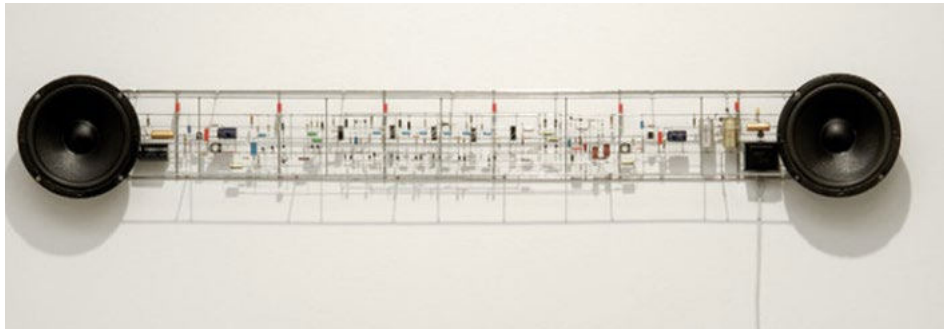




http://www.adafruit.com/flora

Duo - Interactive installation

Duo' is a beautiful interactive electronic sculpture by Peter Vogel. The components and circuits, normally hidden away in boxes, are displayed in various forms in his art works, exposing their vulnerability to the audience. It is an interactive installation. The sounds coming from the speakers can be influenced by moving in front of the artwork, which almost looks like a note bar from a distance. A score for the electronic music it's generating.



www.bitforms.com

Art installations

Further, the electronic PCBs are used in many art installations which showcases the aesthetical appeal of these circuit boards as such and questions the need to design an exterior form over functional elements.

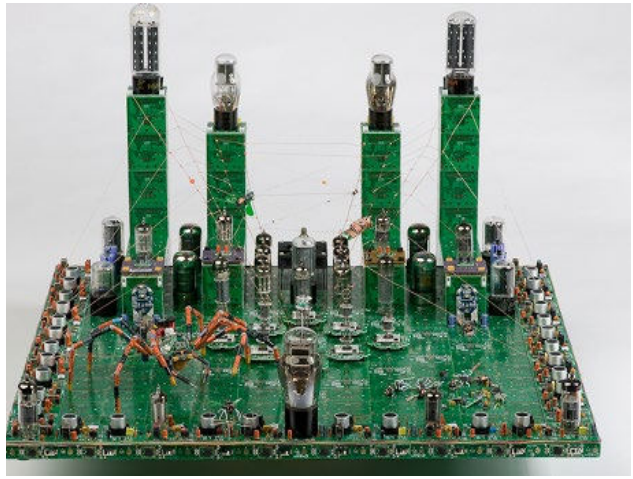
Rearing Horse by Gabriel Dishaw

http://gabrieldishaw.com/rearing-horse/

Technological mandala by leonardoulian

http://www.thisiscolossal.com/2014/06/new-technological-mandalas-and-wrapped-books-made-from-soldered-computer-and-radio-components/

circuit board art by Gabrielshaw



www.gabrieldishaw.com

Radio Study

Conductive ceramic radio

Radio Hibou is a glided ceramic radio which is embellished by using a fine palladium paint that has conductive properties to transmit electricity.

The triangular metallic patterns are ornamental elements and they also play functional role in the object. Each motif has a particular setting: on/off, volume and frequency. The radio is designed in accordance with certain technological constraints. Users can modulate each setting with a smooth interactive gesture.

It looks elegant which can be used as a decorative object yet has a functional aspect to it.

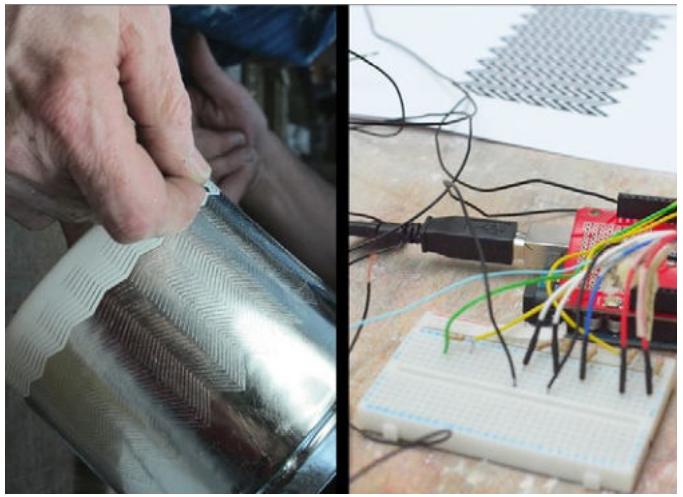
This project was created by Celia Torvisco and Raphaël Pluvinage, French designers currently studying at Ensci – Les Ateliers, with the help of Maxime Loiseau, Sybille Berger and Sylvain Chassériaux.

http://www.designboom.com/design/hibou-gilded-ceramic-radio/

Radio Hibou is the result of collaboration between two craftsmen: a gilder and an electronic specialist

Top view of radio being turned on

Metallic patterns are not only ornamental elements but play a functional role in the object. Each motif matches a particular setting : on/off, volume and frequency



The silk-screened patterns being tested with conductive ink

TEAGUE Radioball

Teague radio ball is a totally new experiment which breaks the monotony of the regular analog radios. It's an exploratory device that encourages discovery through rich 3-D spatial interaction.

With the regular touch screen devices and digital music players, music selection has become flat and boring. This design brings a bit of the fuzz between the stations to discover new channels and physically interact with the channels by rotating the ball.

Each facet of the device is uniquely mapped with the available radio stations. It gives exactly what we want without leaving a room to stumble into alternative choices. By rotating the ball you can increase/reduce the volume. You can place 'I Like' sticker on the ball for the station you prefer the most.

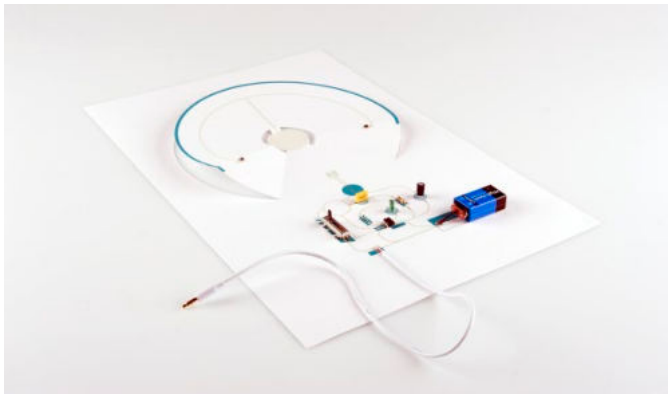
http://www.fastcompany.com/1642904/almost-genius-teagues-radioball-lets-you-rock-and-roll-station-station

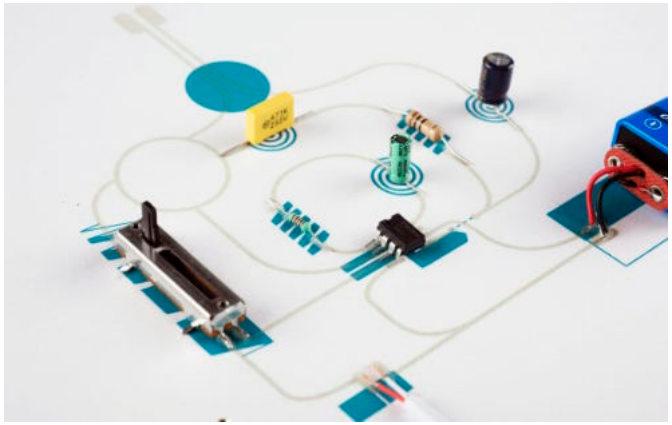
SPEAKER WITH AMPLIFIER

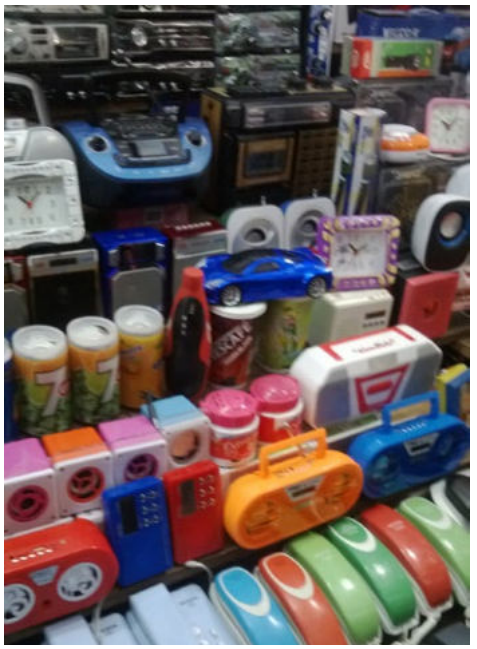
An anatomical chart presenting the hidden operating system in a graphical way. It's made attractive and in a simple way. In the following image, the anatomical chart looks like a skinned speaker, with the components visible and representing the signs that visually represent their technical role and functions.

Once the speaker cone is detached from the sheet and is made 3-d it forms a mechanical amplification for the sound system. The position of the cone is also an indicator of operation. When flat, the speaker is turned off, as the folding close the circuit creating a switch system mechanically.

https://www.adafruit.com/blog/2014/05/20/coralie-gourguechon-anatomical-board-of-a-speaker-arttuesday/





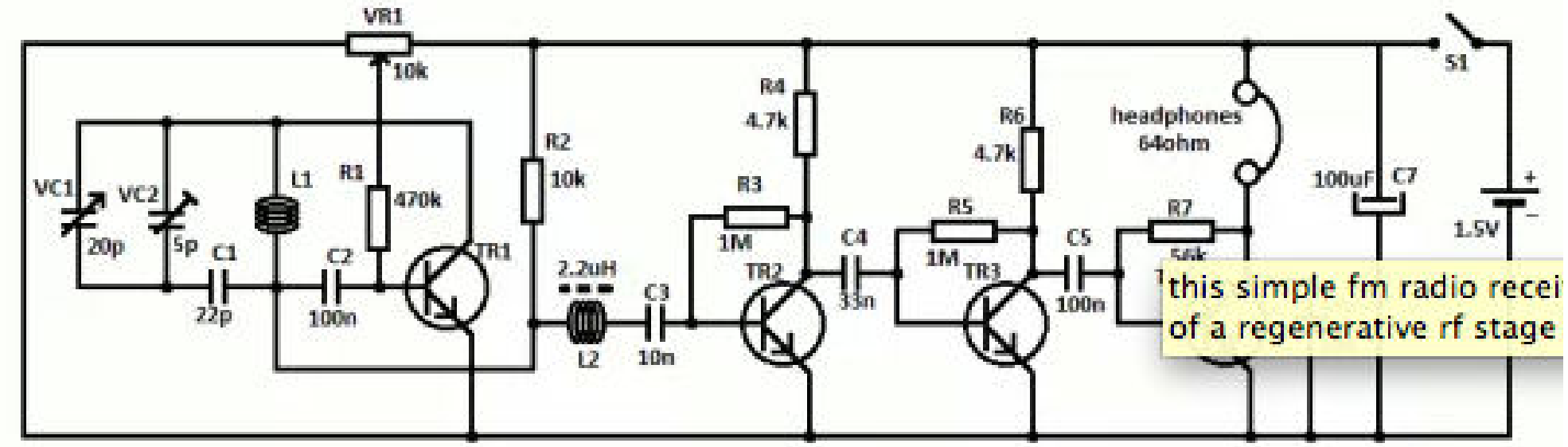


The different varieties of radio forms available are studied and documented

Radio circuit

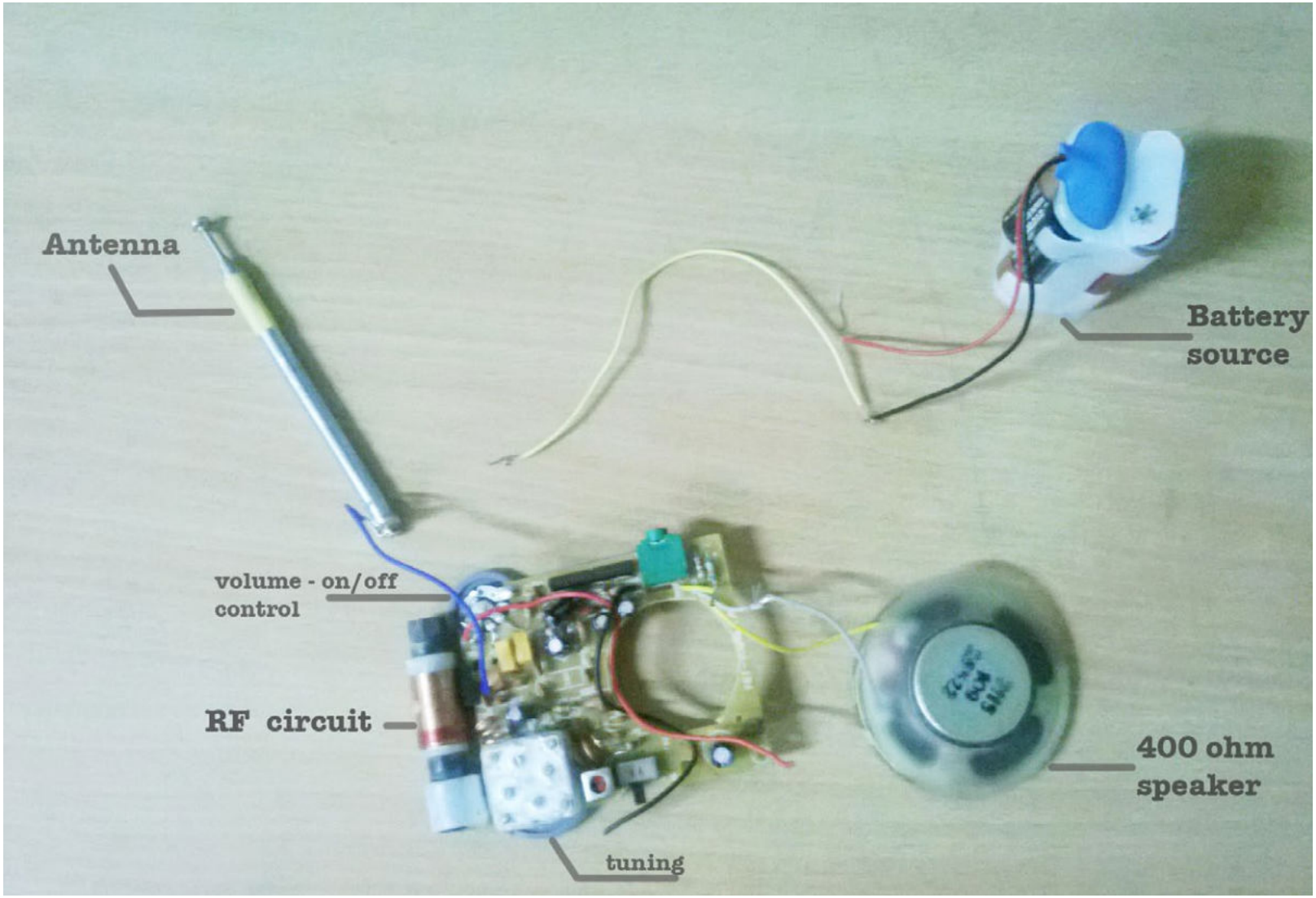
With the advent of digital technology, the FM radio circuit also has gone through many changes. The current radio circuits use IC chips. Our design will use the older circuit which has an RF transistor since the older circuit has more components for form exploration. The circuit is shown as below.
(reference - http://www.electroschematics.com/5923/fm-radio-receiver/)

the circuit has three building blocks which are:
1. input RF amp/osc (regenerative circuit with transistor TR1 BF199) this is the portion which acts as an oscillator to pick the high frequency radio signals
2. RF choke L2 (used as some sort of VERY simple de-modulator for FM. It "chokes" RF component from the RF signal and leaves only audio component that is further amplified)
3. Audio amplifier sections TR2, TR3 and TR4 which amplifies the audio signals



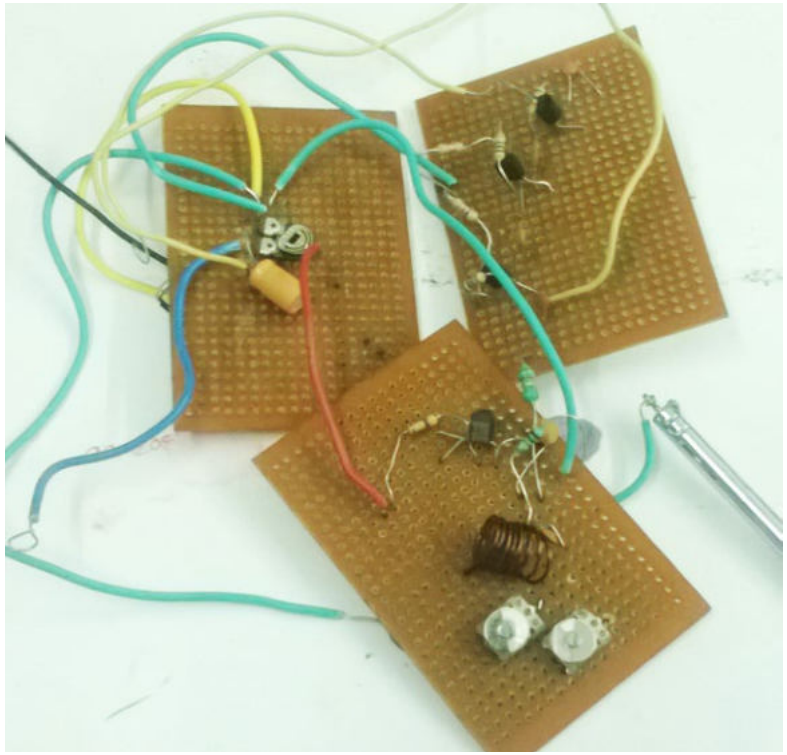
This simple fm radio receiver circuit consists of a regenerative rf stage, TR1, followed by a two of three-stage audio amplifier, TR2 to TR4.

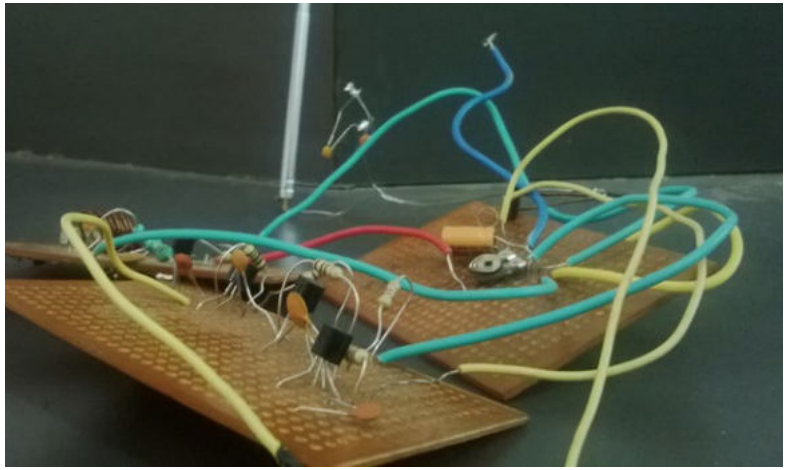
Part identification

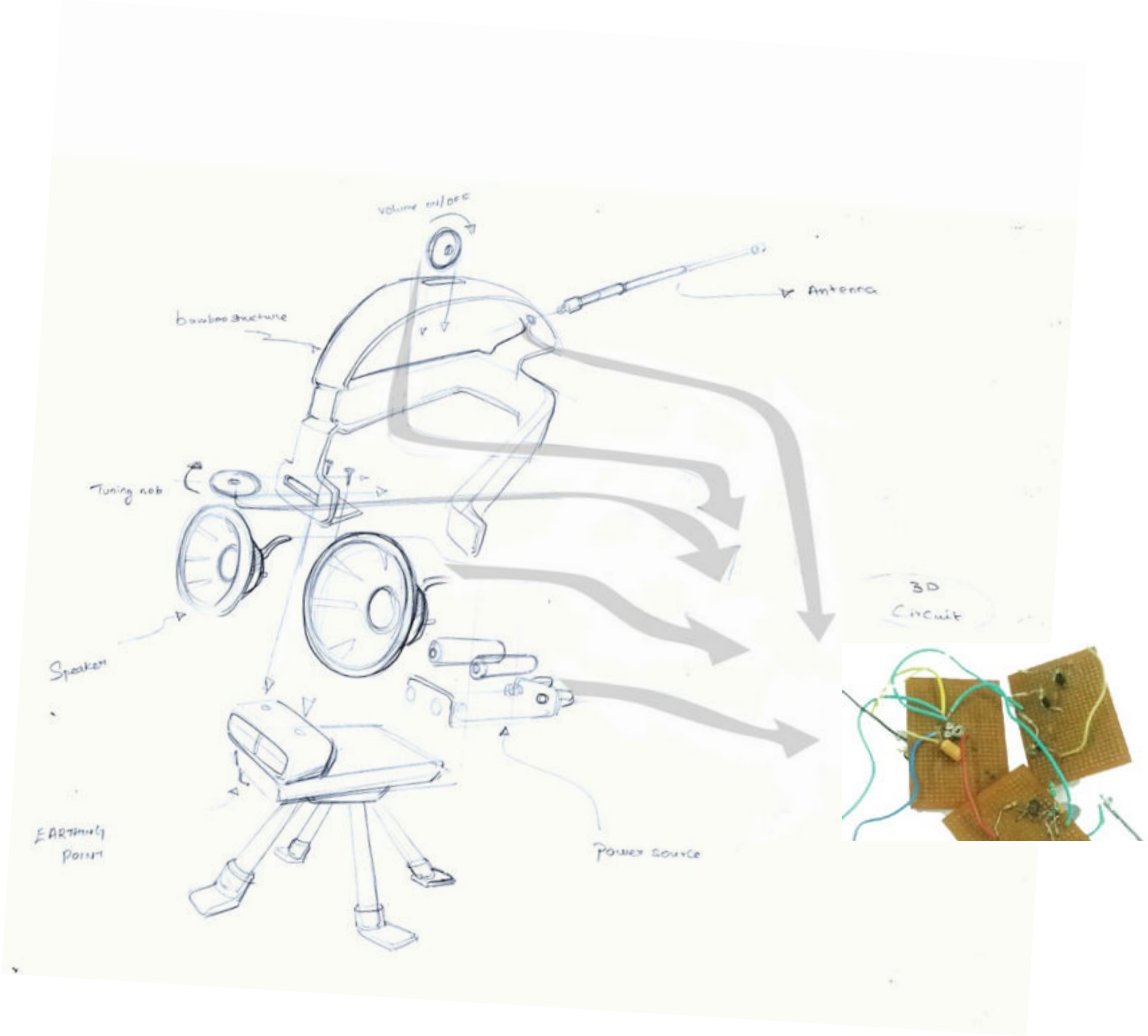


Concept Explorations

Initially the circuit is tried out in a breadboard. Then the individual circuit is broken down and soldered in different PCBs at different planes.






Volume on/off
Antenna
bamboo structure
Tuning nob
Speaker
3D
Circuit
EARTHING
POINT
POWER SOURCE

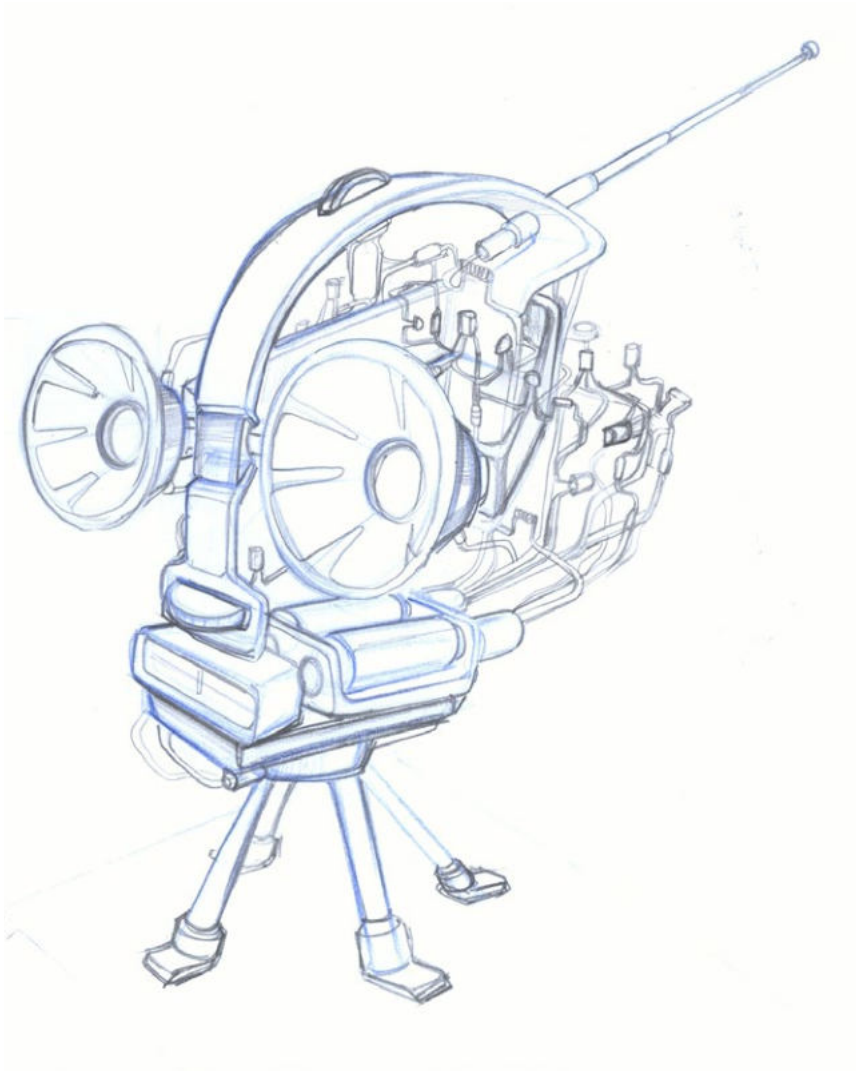
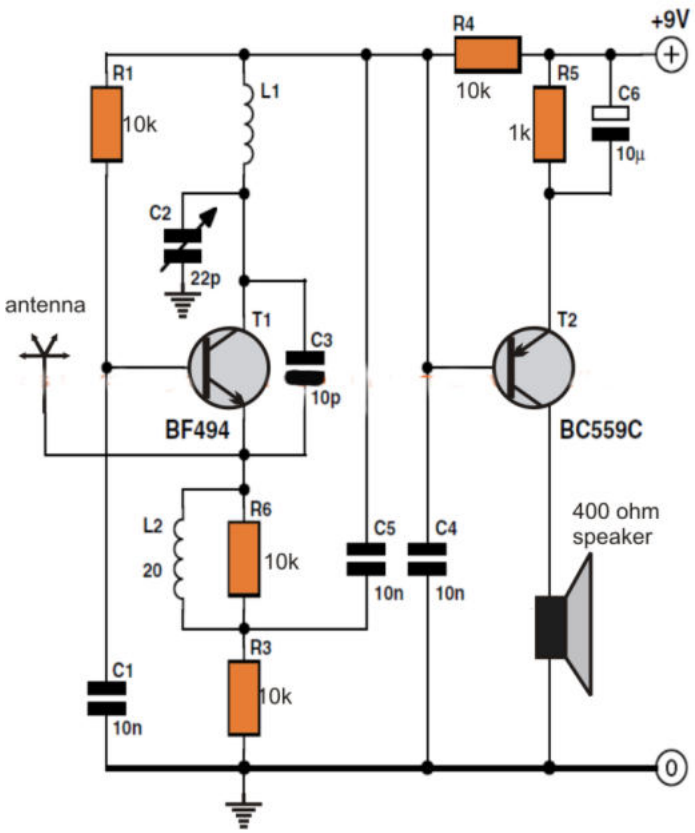


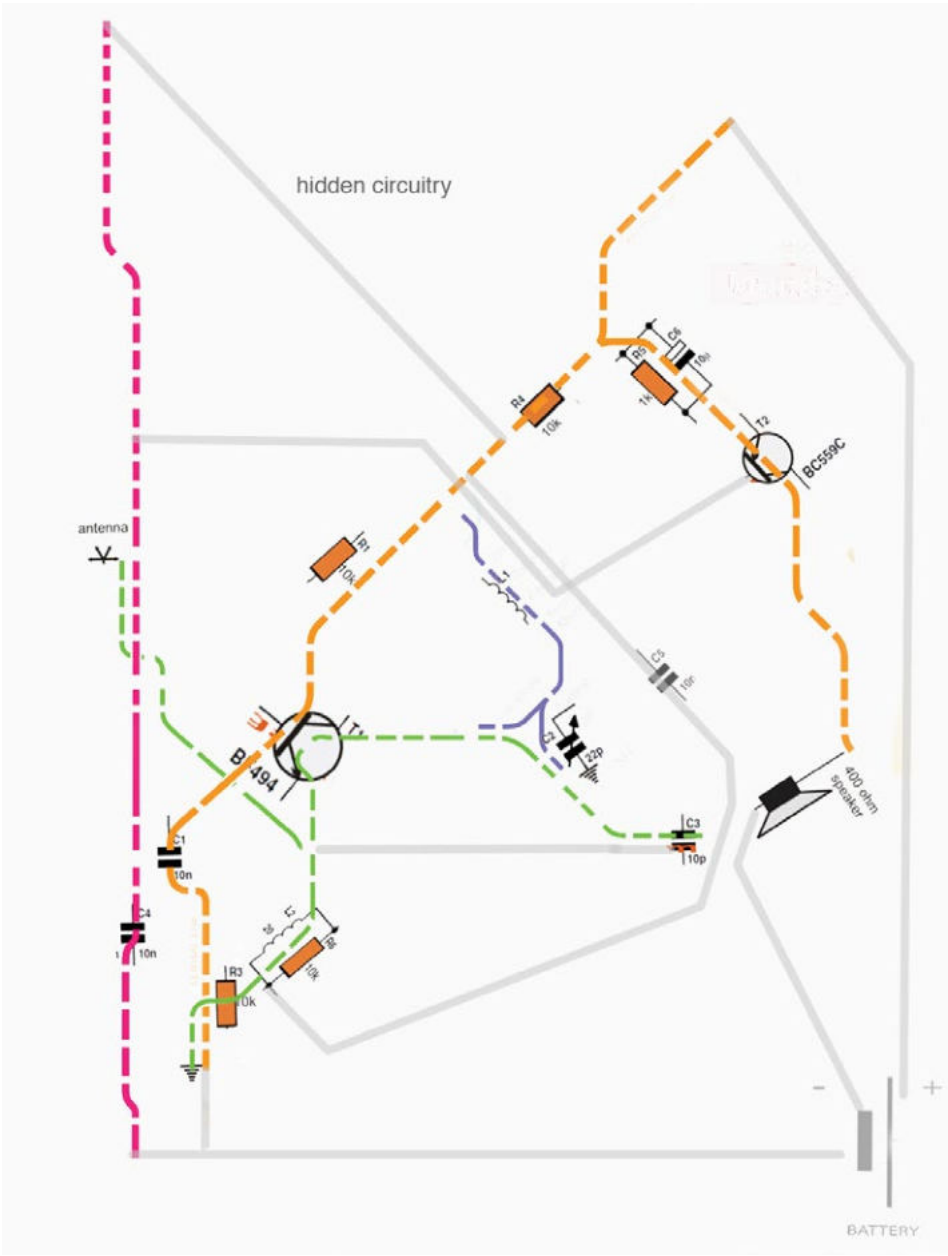
Illustration of Mumbai train map using the radio circuit

The above map designed by Snehal Patil and Jaikishan Patel Visual Communication at Industrial Design Centre, is taken as reference.



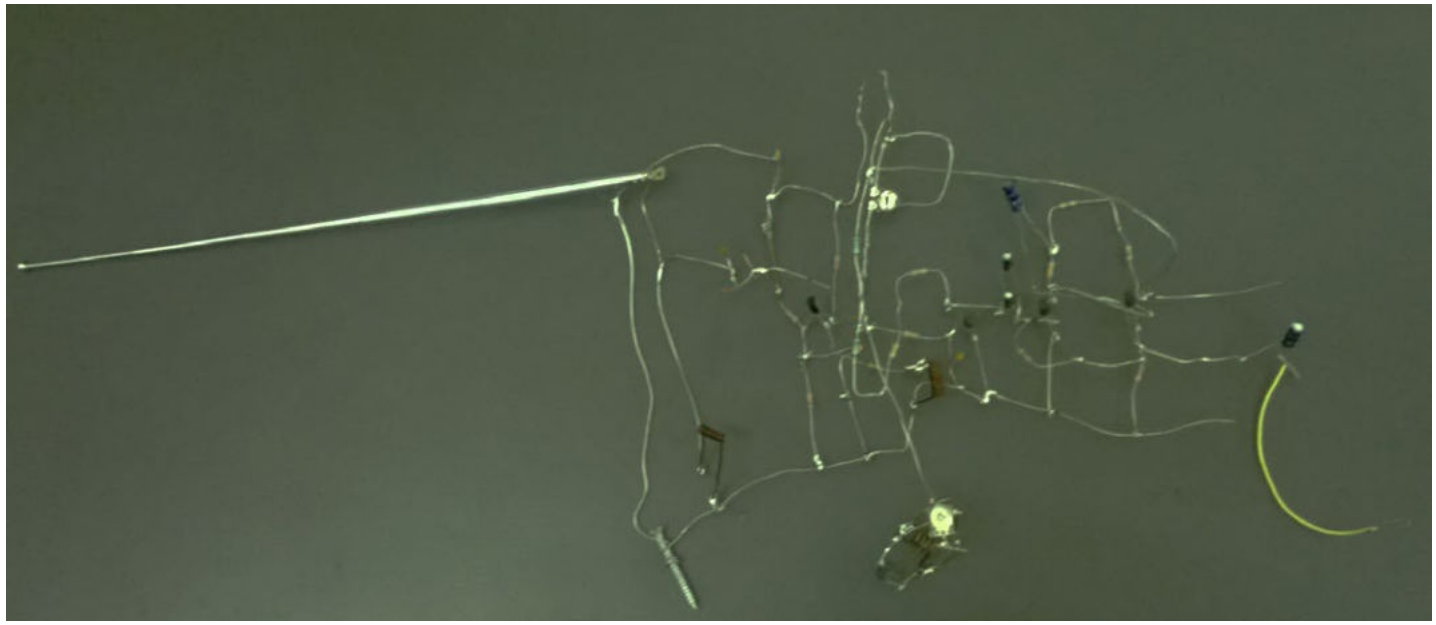
The above simple radio circuit was taken for illustration.
reference - http://www.mid-day.com/articles/maping-the-mum-bai-local/243917

http://www.mid-day.com/articles/mapping-the-mumbai-local/243917



The circuit is studied and overlapping of the functional elements is done over the basic train routes from the map

Copper wires can be soldered in 3d along the route connecting the ciruit elements and the final design is as shown with black background representing mumbai map.



The radio circuit is soldered without PCB base and constructed in 3d to check the possiblilty of working. By eliminating the PCB and rearranging the elements graphically without affecting the functions, the radio circuit can be given different visual forms without any external casing.

Further scope

This work can further be explored to arrive at three dimensional forms for 2d electronic circuits. The circuits can not only have a function but also a visual meaning and can become a work of art. Further explorations and prototyping has to be done for the radio circuit