

**Sadouq El-Musiqqa**

AA Alexandria Visiting School '12

HyperSpace dB



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# Table of Contents

## **Introduction**

Problem / Aim / Concept.

## **Brain Storming .**

Early Sketches /Developing ideas.

## **Process:**

Choreography Team.

Perfume Team.

Harmonics Team.

## **Technical drawings / Model Setup .**

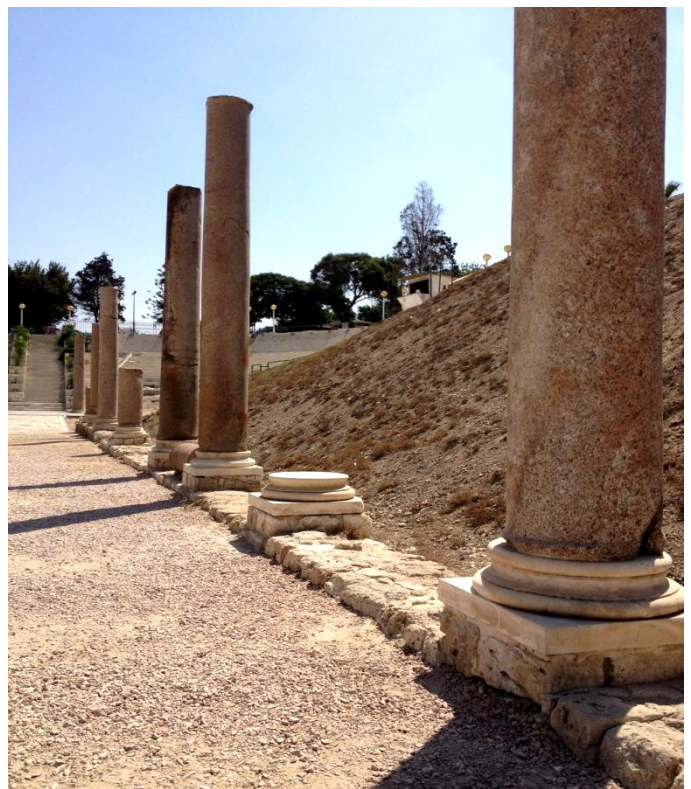
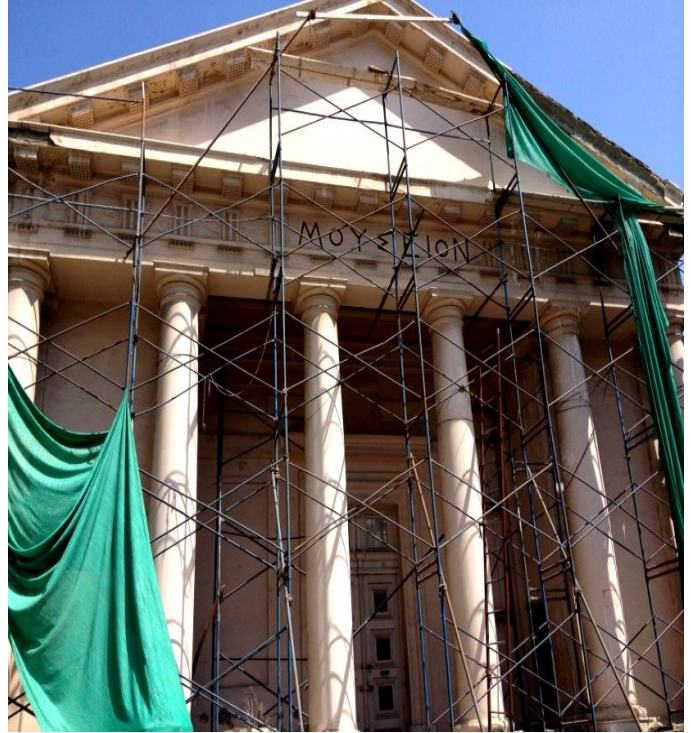
## **Project Assembly .**



# Abstract

Alexandria is renowned for conducting huge geo-engineering experiments to excavate and preserve cultural artifacts. The Roman amphitheater, Qtaiey Fort, and various shipwrecks are among many examples.

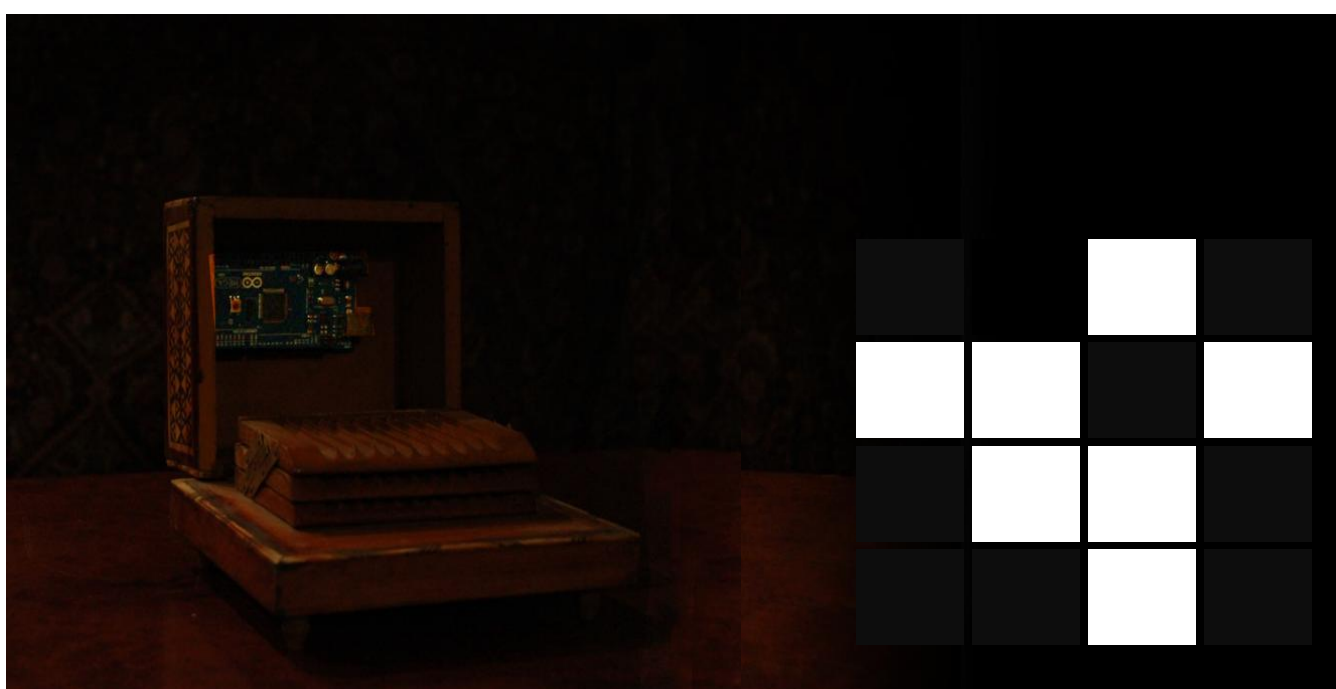
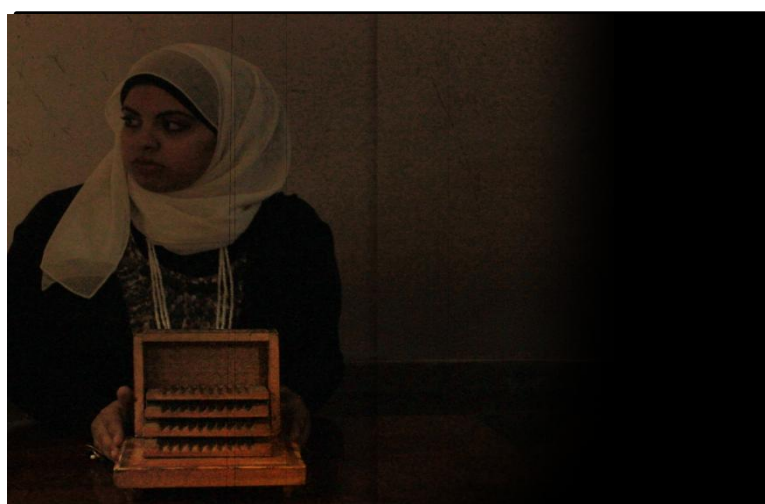
Sadly, many local Egyptian antiques are overlooked by organizations like the Supreme Council of Antiquities; they are pawned off to tourist shops, and they are frequently overlooked.



# Concept

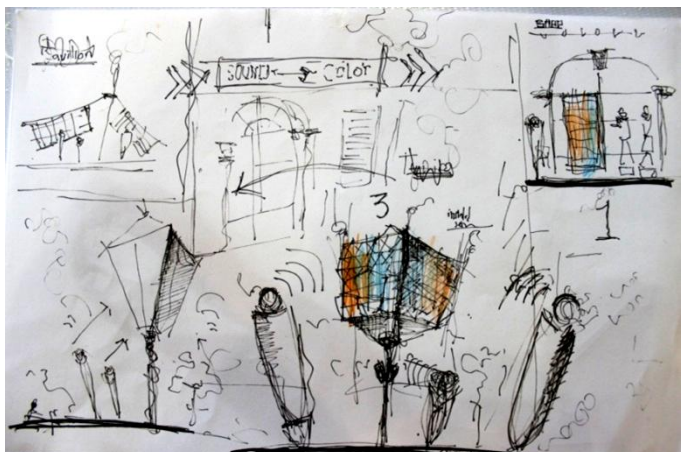
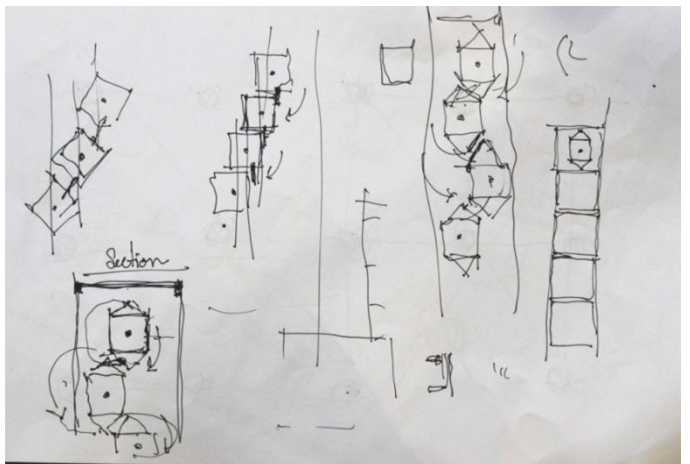
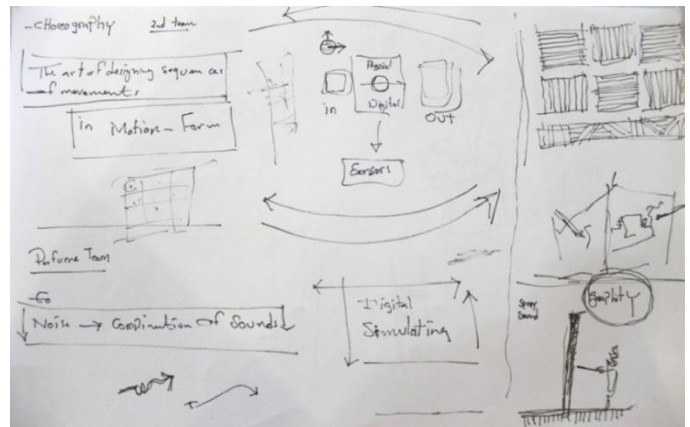
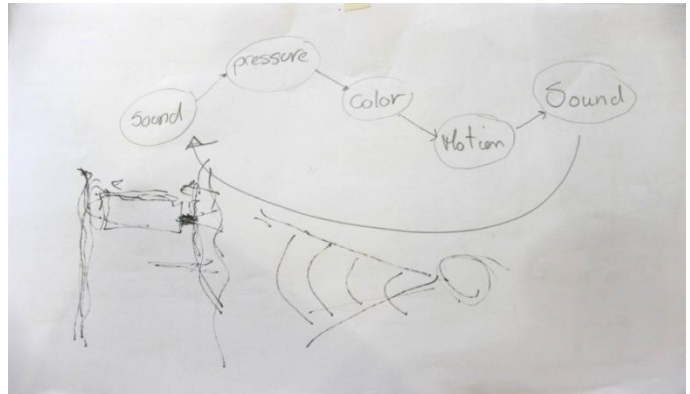
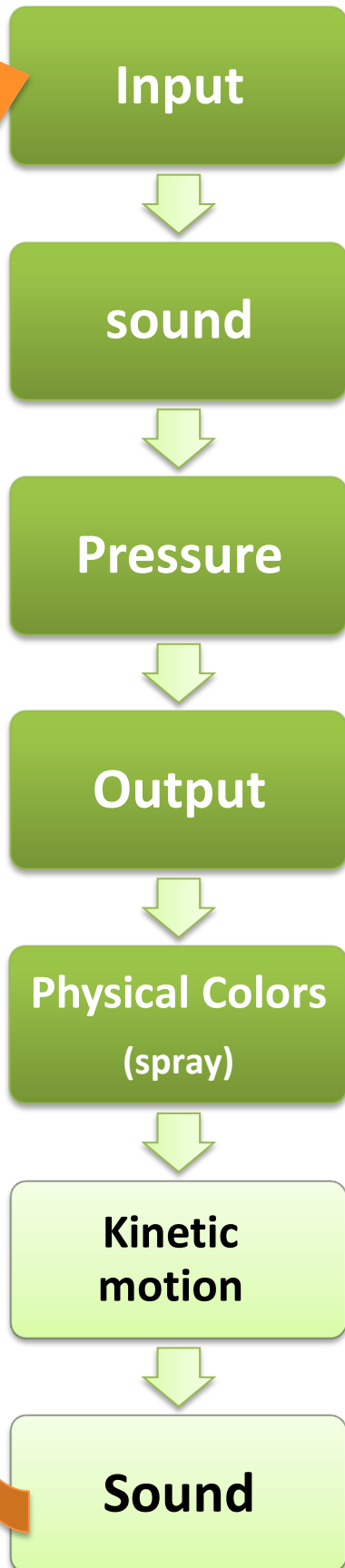
**Sanduq El Musiqi** is a project that attempts to revive and resuscitate an 80 year-old music box from a corner shop in Masala that once played “Ah ya Zain” by Said Darwish .

Using Arduino ,Processing and emerging technology, this installation connects a sonic heirloom with an interactive platform and motion sensors , allowing users to re-imagine the sound box experience in a strange and quirky way.



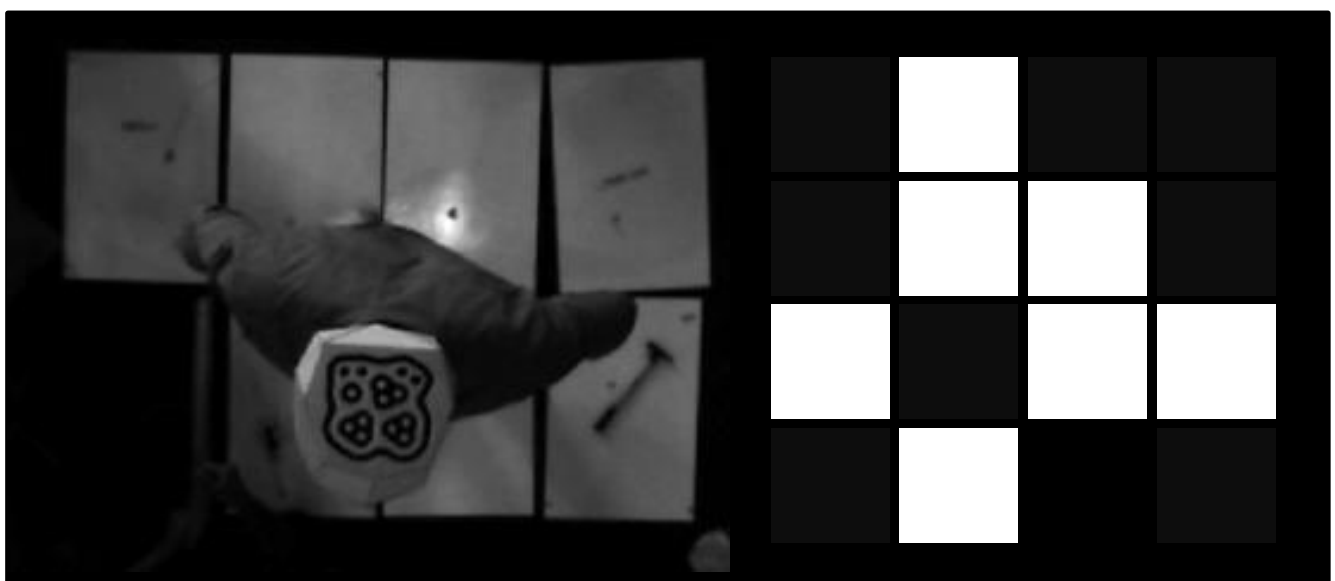
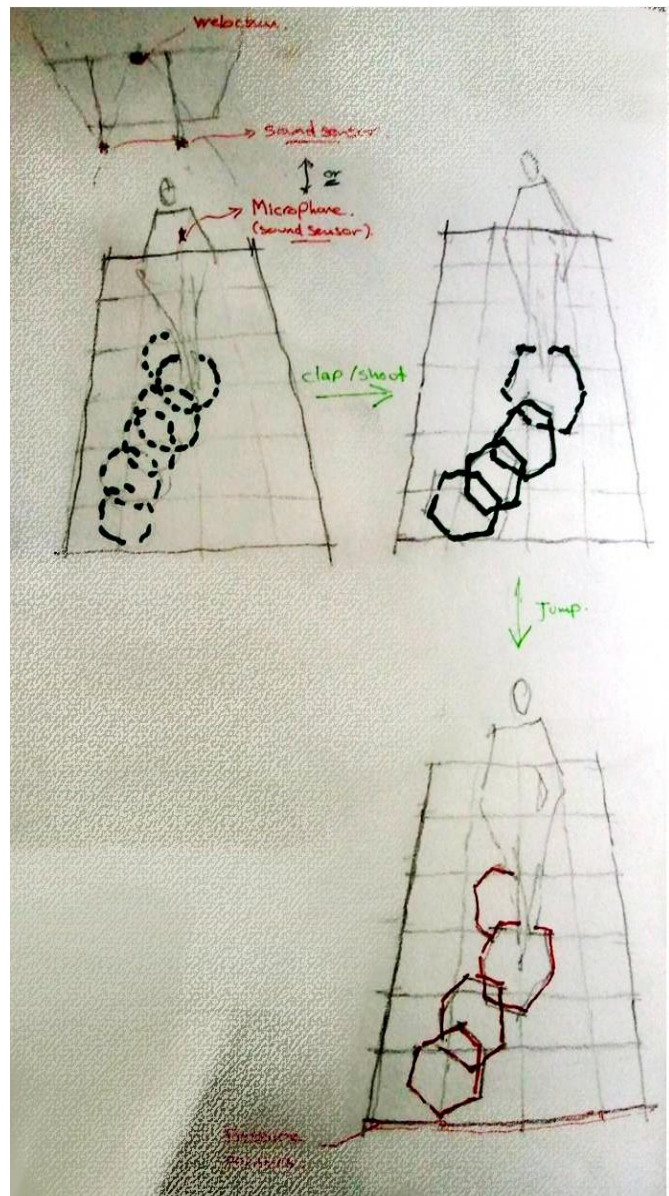
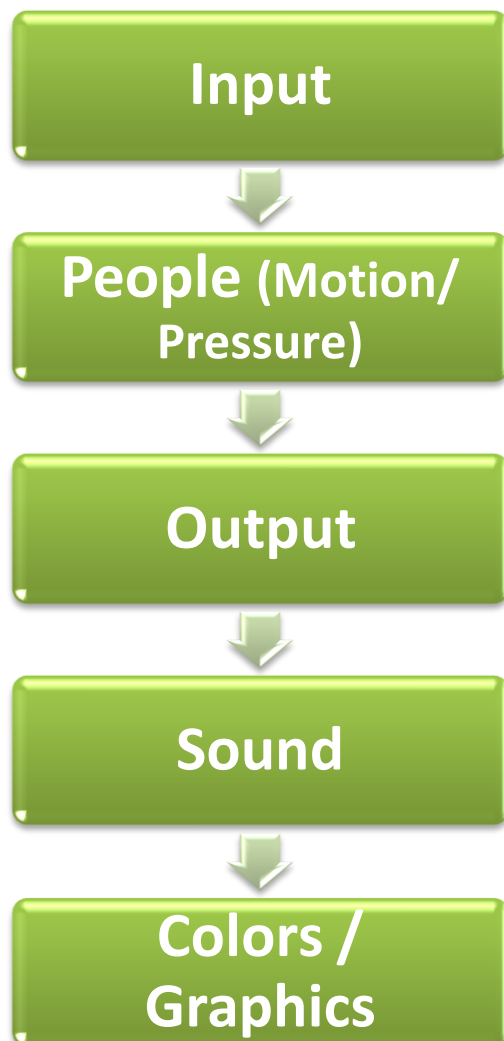


# Starting Idea





## Developed Idea



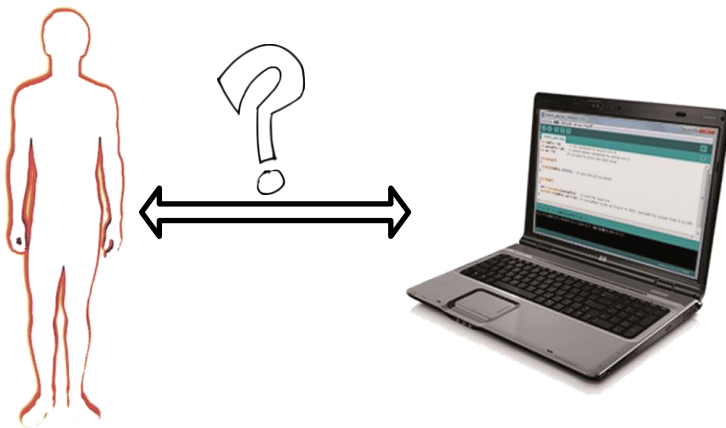
# Choreography Team

## Hyperspace dB

▪Choreography team was mainly responsible for getting the data and passing it through to "The perfume team"; which means that – in order to be interactive with people - we have to translate people's actions into data to be used as an input for the code used to control the whole process



▪Our dilemma was deciding the inputs needed to catch each human action, and coordinating with different types of inputs; in order to get clear data to be processed



### Available Resources:

For In-puts

1. Web Camera.
2. Marker
3. Kinect.
4. Vibration sensors.
5. Arduino.



▪The idea was to produce (Tones and colored shapes) that are responsive to human actions (Movement, strength, sound ...) each of these actions needed to be captured. Several ideas were proposed and experimented in order to decide different inputs for different actions:

- Capturing people movement.
- Sensing the people.

## ■ Capturing people movement:

Human movement was captured using a simple webcam mounted above the interactive area. The colored shapes -that is the output of the process- were supposed to be projected on the same area that people interact with.

After several experimentation and negotiations with "Harmonics" team -The output team- we found that the webcam is not accurate enough to detect the difference between the movement of people over the platform and the shapes projected on it; so we had to challenge ourselves to find a way of capturing movement of only people movement uninterrupted by any other movement. Two solutions were proposed:

### 1. Using Microsoft Kinect:

Microsoft Kinect is a motion sensing input device by Microsoft for the Xbox 360 video game console and Windows PCs.

Kinect not only detects motion, but it detects human figures and could track their movement without being interrupted with the surroundings of the moving human.

Then, we need to find a way to connect Kinect with our computer to be able to get data from it in the form of coordinates referenced to the platform. Two software programs were thought to be useful for this task; Grasshopper (Plugin for Rhino), and Processing software. Our first suggestion was using Grasshopper, but after negotiations with the other two teams and several experiments on using the two softwares; we found that we

were able to create tones in Processing that are more controllable and accurate and sounds better than those we created in Grasshopper.

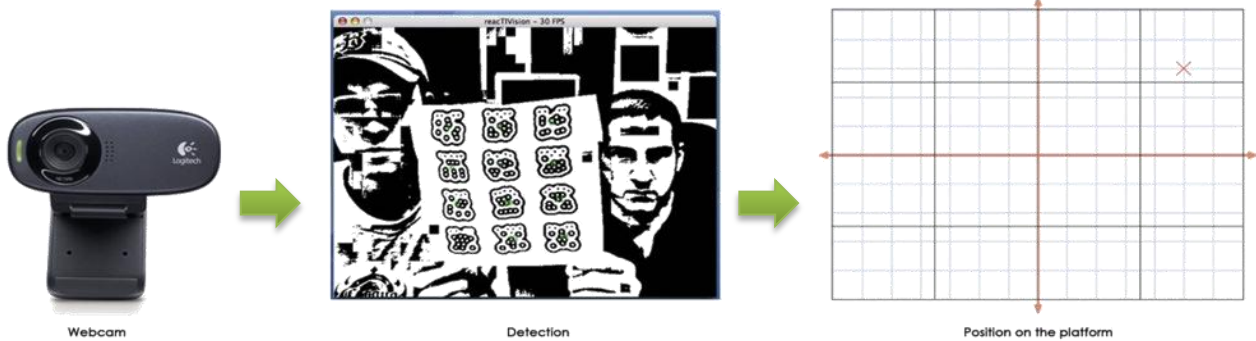
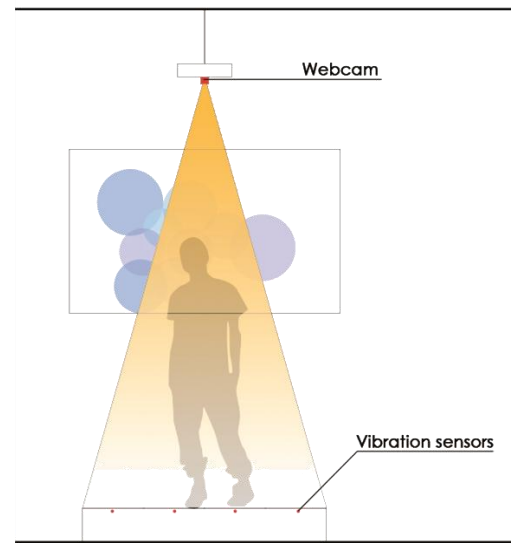
Using Processing 2.0; we were able to get the data needed from Kinect and detect the exact position of people. Then "The perfume" team's mission was to transform this data into an output. They worked hard trying to coordinate between the input values from Kinect and the output as sound. But unfortunately they failed in doing this; as the sound library (Minim audio) used in the Processing code only runs on Processing 1.5.1 and Kinect only works with the Processing 2.0. That was why the team decided not to use Kinect for motion detection



## 2. Using a webcam and "reactIVision":

ReactIVision is a cross-platform computer vision framework for the fast and robust tracking of fiducial markers attached onto physical objects.

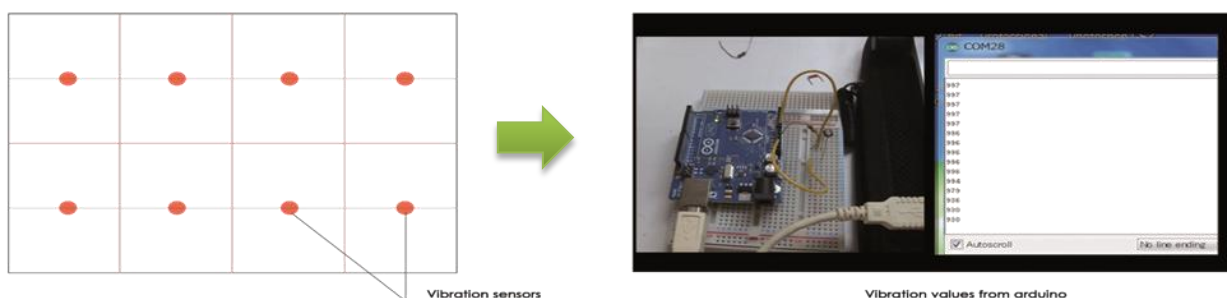
In this proposal we tried to find a way to increase the accuracy of the webcam to detect the motion of human. ReactIVision detects only the fiducially markers appear in the field of the camera and easily tracks its motion without being interrupted by other moving things. Data was transferred from ReactIVision to Processing using (TUIO) Processing library, and it worked fine with the sound library we need for our output.



### ■Sensing the people:

In order to be more interactive with people moving over the platform; our installation had to not only see the people (motion detection by the webcam), but also it has to feel them!

To achieve this we thought of using pressure sensors under our platform. And these sensors would sense the strength of the person that is moving on the platform; so when a person is jumping over the platform he gets different output than when he just walks on it. After many experiments and trials we found that pressure sensors could not completely achieve our purpose so we used vibration sensors instead and got much accurate values.







## PERFUME Team

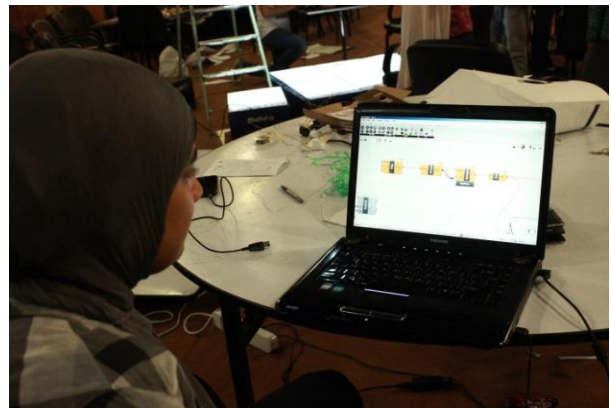
### Hyperspace dB

The Perfume team will tap into sounds in the space, by amplifying, attenuating, or damping existing sounds found in the immediate environment.



■ As **Perfume team** is the link between the inputs and outputs, it concerns in simulating the whole process.

■ To achieve that we tried using different programs to define which would give the best results in both inputs and outputs. So we tried Grasshopper, Processing and Arduino.



Simulating by Grasshopper



Processing with Marker (inputs)

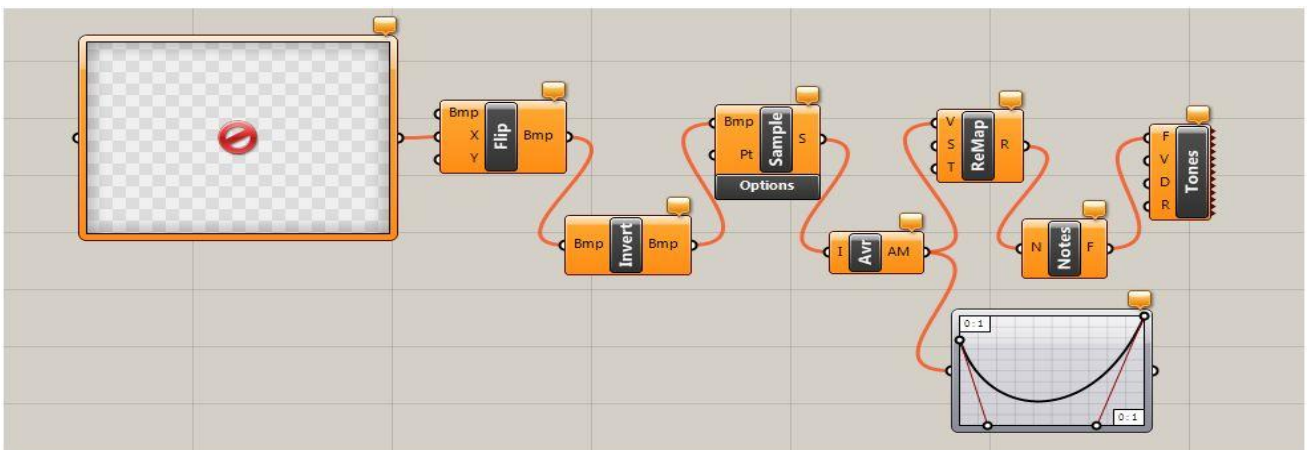


Processing for Graphics & Sound (outputs)

## Grasshopper (First Trial):



- Firstly we tried using Grasshopper to translate videos directly to sounds then we were supposed to use those sound's values creating graphics and colors.
- So we used video player from (Firefly Plug-in) inverting it to Bitmap then using Bitmap Sampler to get different values and using them with ReMap / Graph Mapper the using those values to get different notes creating Tones .
- Then we tried using values we got from Grasshopper 's Tones into Processing to Create Graphics but the Tones' values we got weren't accurate enough to get the result and effect we need.

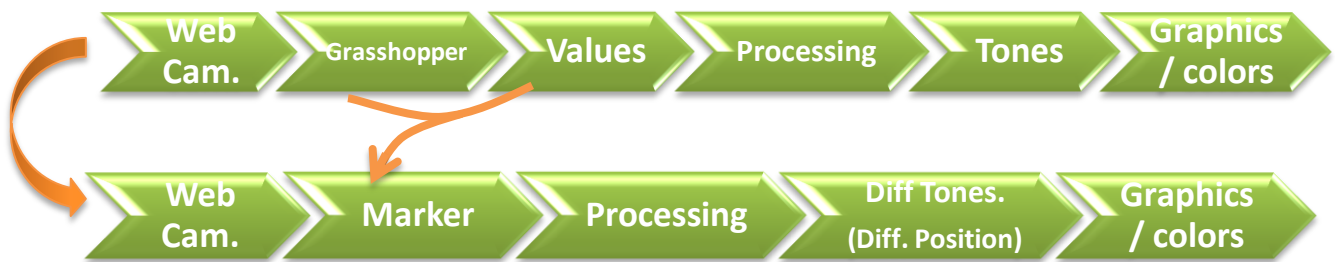


## Grasshopper & Processing (Second Trial):



- Secondly we tried using Grasshopper only for translating Live Video Player (Web Cam) to Values using them in Processing to create Tones and Graphics directly from Processing.
- The main problem in this trail was that the webcam with Grasshopper (Firefly plug-in) wasn't accurate enough to detect the difference between the movement of people over the platform and any other movement.
- so we had to challenge ourselves to find a way of capturing movement of only people movement

## Processing (Third Trial):

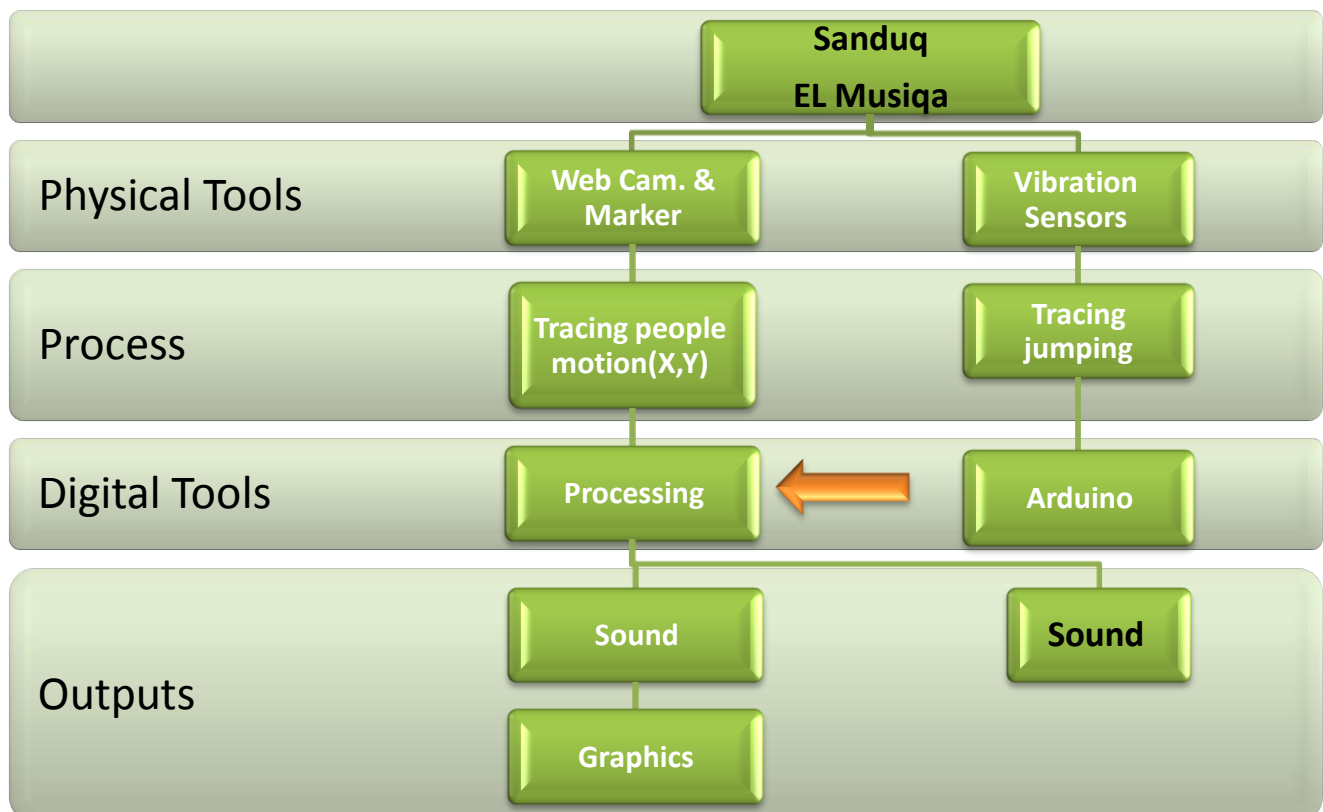


▪ Instead of using the webcam and Video Player from Grasshopper we tried using a **webcam and "reactIVision"**.

▪ ReactIVision detects only the fiducially markers appear in the field of the camera and easily tracks its motion without being interrupted by other moving things. Data was transferred from ReactIVision to Processing using (TUIO) Processing library, and it worked fine with the sound library we need for our output.

▪ The other thing was to get the values from the vibration sensors ; so they were connected to an Arduino board (A single board micro-controller programmed using the Arduino programming language) then these values were transferred to Processing to be used as another input parameter for our code.

▪ The whole simulation is showed in the chart below:





# HARMONICS Team

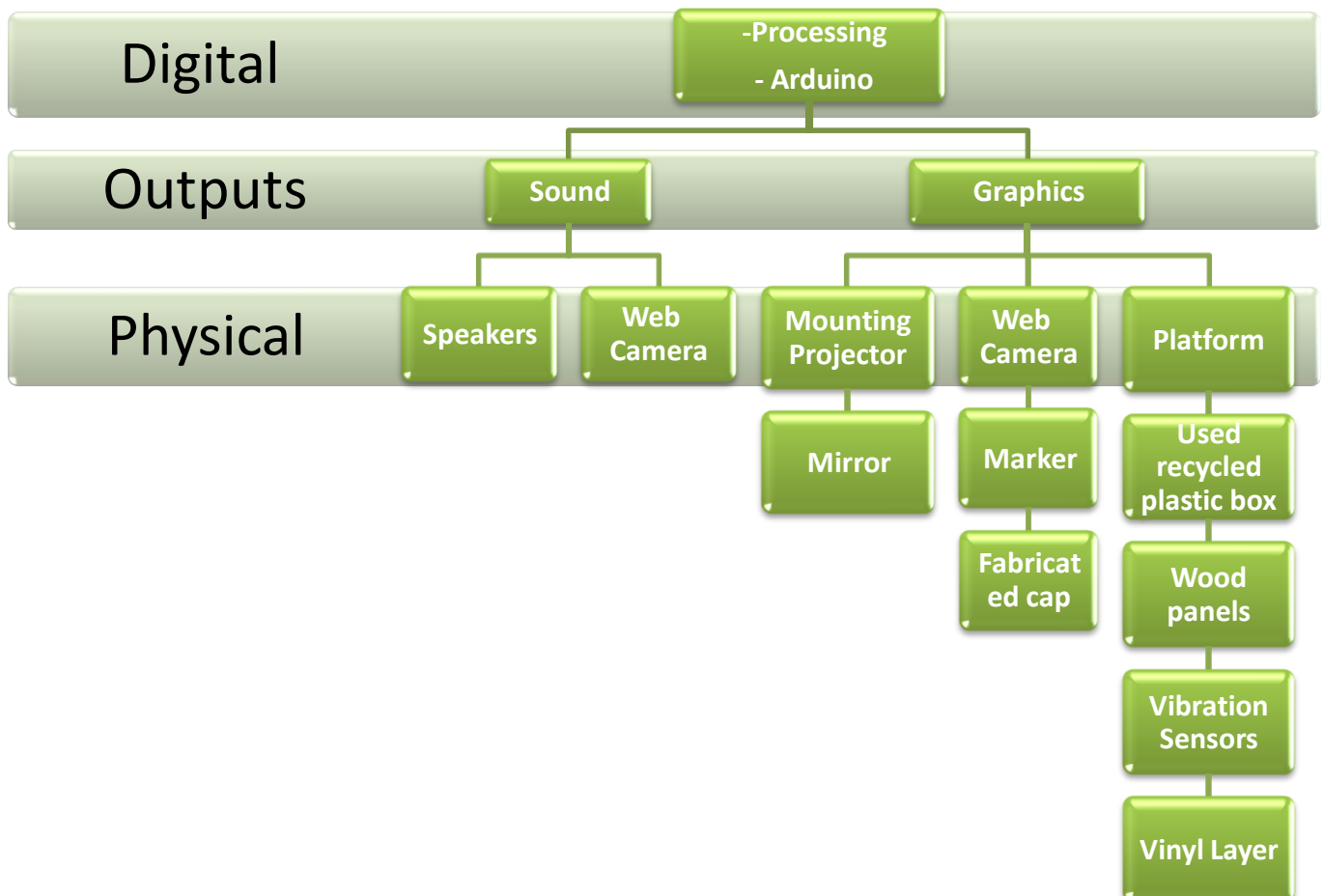
## Hyperspace dB

Explore analogues & digital methods of design and fabrication to produce sound



▪AS HARMONICS Team is dealing with how to get the outputs ,so we concerned in both Digital and Physical Tools and how to install them together.

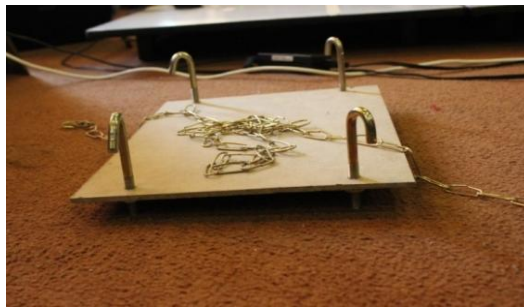
▪The whole process of HARMONICS Team is showed I the chart below and the details of each part is described in the next pages :





## Mounting Projector

▪As we need to project on the floor ,so firstly we were in need to a mounting projector so we made a base from MDF and fixing it with four metal holders & chain then it was installed in the suspended ceiling.



Graphics

Mounting  
Projector

Mirror

## Mirror

▪After the mounting projector we needed to fix a mirror on 45 degree with the projector so it could reflect it vertically on the platform.

▪Firstly we had 45 degree wooden angles and made grooves on their edges holding the mirror and we fixed it with wires to the ceiling but it wasn't well fixed .

▪Secondly we made a fabricated projector's cover with the 45 degree mirror built in to make it accurate and well fixed.



Graphics

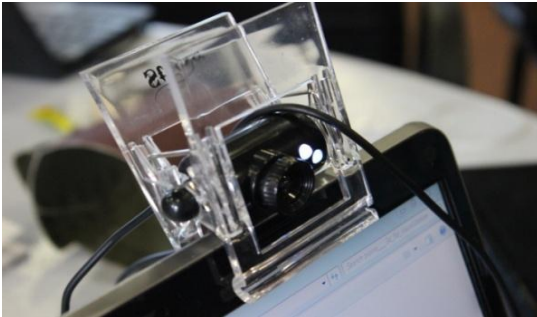
Mounting  
Projector

Mirror

## Web Camera

▪Firstly we tried using webcam to have a live video player detecting people motions but we found that the webcam alone is not accurate enough to detect the difference between the movement of people over the platform and the shapes projected on it; so we used "reactIVision" with its marker .

▪So we need to fix a high resolution webcam up to the ceiling looking downwards to the platform to track people motions (tracking markers attached onto physical objects).



Graphics

Web  
Camera

Marker

Fabricated  
cap

## Marker

▪To detect people motions , we used webcam and "ReacTIVision" .

▪ReacTIVision is a cross-platform computer vision framework for the fast and robust tracking of fiducially markers attached onto physical objects.

▪We fabricated a cap with the marker on its top but we developed the cap's shape several times to make sure the marker is always horizontal and clear to be detected by the webcam.



Graphics

Web  
Camera

Marker

Fabricated  
cap



## Platform

▪As we wanted to detect people motions (input) & project graphics on the floor (output) we were in need to a platform installed with the webcam, sensors, projector,... etc.

▪So firstly as an initial trial we used folded tables as platform to:

▪Detecting people motions-moving & jumping- (input):  
we connected the platform with vibration sensors using Arduino to get the values from it, and we also adjusted the distance between the platform and webcam.

▪Projecting graphics on the floor (output):  
We adjusted the distance between the platform and the projector range but we found that people shadows on the platform ,because of the inaccuracy of the mirror with the projector, interrupted with the graphics d made it unseen.

▪So according to the because of the lack of time to fix this problem we decided to project on the wall.



Graphics

Platform

Recycled plastic box

Wood panels

Vibration Sensors

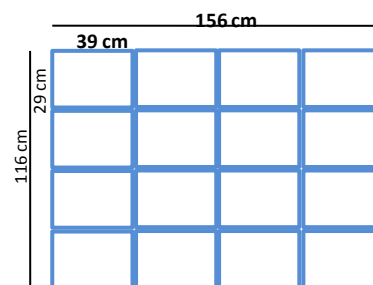
Vinyl Layer

## Recycled plastic box

▪To detect people motions using the vibration sensors we needed a surface with solids & voids to sense the vibration between them when people jump on it .

▪We thought lot and had several ideas to fabricate special surface then came the idea of using Recycled Pepsi plastic box with its fabricated bottom as our platform surface .

▪Each box has dimensions of (39\* 29 cm) so we used 4 \*4 boxes (156 \* 116 cm) tightened them strongly together using plastic wires.



Graphics

Platform

Recycled plastic box

Wood panels

Vibration Sensors

Vinyl Layer

## Wood panels

▪We used MDF 5mm cutting it to the dimensions of 2 boxes so we had 8 MDF panels each of 60 \* 40 cm then we found that its better for the vibration sensors values to have separate panel for each box with its sensor . So we cut the 8 panels to 16 each of 30 \* 40 cm.

•We also used nails to fix each panel from its four corners to each box .



Graphics

Platform

Recycled plastic box

Wood panels

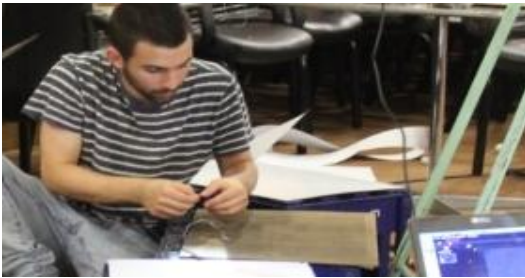
Vibration Sensors

Vinyl Layer

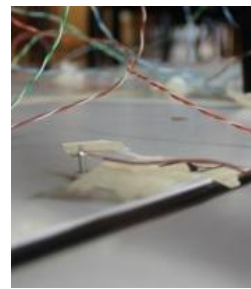
## Vibration Sensor

▪Firstly we used pressure sensor to detect people jumping but we found it wasn't accurate enough detecting the difference between the people movement over the platform and when they jump.

▪So we replaced the pressure sensors with vibration sensors fixing one of them to each panel .



vibration sensors



pressure sensors

Graphics

Platform

Recycled plastic box

Wood panels

Vibration Sensor

Vinyl Layer

## Vinyl Layer

▪Finally we were in need to have durable white surface for the platform ,So we used vinyl sheets cutting them to the same dimensions of the panels and fixing them to each panel using the vinyl adhesive face .





## Assembling “Sandouq El-Musiqi” with the context (Alex Pedestrian’s Tunnel)

As architects we were thinking in

**How** “Sandouq El-Musiqi” can add values to people experience in the space and to the space itself !?

**Where** could it be assembly !!?

**How** could it interact with the urban space and the context !!??

- During our 10 days we spent in Alexandria we had to go downstairs to the pedestrian Tunnels to cross the roads several times every day , we found it gloomy ,silent ,boring and nothing is going on.
- So come the idea of assembling “Sandouq El-Musiqi” in the pedestrian’s Tunnels to add a new dimension to it and to add a new interesting and valuable experience to the pedestrians through their motions and how it produce sounds d graphics with different colors encouraging them to go downstairs to the tunnel .



And Yes Finally We Made it ;)

# SANDOQ EL MUSIQA

