Abstract — This work deals with creation of affordable computer vision based visual art systems with the help of open source solutions found on market. The particular project described in this paper has been created with the help of Arduino board, programmed with Processing and uses some OpenCV features to create photos with long exposure time. With the help of the specially designed software one is able to “draw” light sculptures on such photos by moving small mobile robot with precise positioning system.

I. INTRODUCTION

Nowadays it is obvious that open-source solutions stimulate innovations. Utilizing the principle of freedom of information open source helps people all over the world to create new devices and technologies on the base of opened solutions. This is how regular people can participate in technological progress. Freedom of information also makes modern technologies accessible for people without or with slight technical education, like, for example, artists.

Internet is full of examples of successful implementation of open source software and hardware in arts and related fields. There are special simplified programming languages available for free, some of them concerned to be artistically aimed. Processing is a good example of this statement [1].

II. PROBLEM

Photography with long exposure time is a perspective field in modern visual art. It is created with the help of the camera with increased exposure time. Objects are moving in front of such camera leaving light and motion trails on a picture. Usually this technique is used in dark environment and requires moving source of light and stabilized camera position.

III. IMPLEMENTATION

The whole system consists of camera, placed above robot and giving “bird’s eye view” on its working space, computer, providing Processing-based software and mobile platform with radio transceiver and bright LED.

As one of the goals of this project is to show how open source can be applied in modern arts, it is obvious open hardware and Arduino should be used as it is a great example of such system. Moreover, it also simplifies the whole project as its programming language is a derivative from Processing. The Arduino based platform is connected to user’s PC through wireless channel. The platform gets instructions and information about desired trajectory, then it starts to execute them with the help of positioning system, so that the error of position is not accumulated during execution process.

Artist’s needs might require robot to move on complex trajectories, which are hard to represent in form, suitable for controlling device. That’s the main reason why this project is based on methods of computer vision which can track position of mobile platform and amend its route. The instrument of achieving this task is Processing programming language with Open Source Computer Vision Library (OpenCV).

OpenCV is released under BSD license and has C++, C, Python and Java interfaces and supports Windows, Linux, Mac OS, iOS and Android. Its usage ranges from digital art to advanced robotics.

The position and orientation of the robot is determined by analysing the global image [2]. The robot is distinguished from the environment by color markers [3]. For correct work it should be aligned so the optical axis would be perpendicular to the ground surface. Otherwise, the path will differ from original trajectory.

The main disadvantage of this method is a deformation of drawn trajectory caused by rotation of the robot, but it can be fixed with decreasing speed and using more precise cameras.

Software creates graphic user interface which allows artist to draw robot’s trajectory in control window. Then, it’s being aligned with camera’s view. The movement of robot is similar with line-tracking machines: if program finds out that robot is out of the track, it makes corrections into its course so it follows the line until it runs off the track again.

As this is the open source project, it will be possible to create and share its modifications without any restrictions.

IV. CONCLUSION

As project is being developed, future ways of improvement are being analysed now. For example, it will be interesting to create a hive system, utilizing these principles and by changing algorithms of hive agent interaction obtain new kind of photos with long exposure time.

REFERENCES