Title: **Vision Based Interactive Robotic Exhibits for Museums**

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Abstract-Interactive museum displays or exhibits are ones in which you are able to touch and feel yourself. The benefits of an interactive exhibits or interactive displays are the hands-on learning approach. This hands-on approach can not only assist the visitor with learning, but it can also get them excited. Interactive museum displays and exhibits enable promotion of creativity and imagination in the young minds who usually are the frequent visitors.

Robotics being one of the futuristic technologies has been a subject of excitement to everyone and forms a potential interactive exhibit candidate at the museums. With this aim, a 5 Degrees of Freedom Pick and Place Robot Arm with an Innovative Vision System has been developed in house. The Robotic arm with the help of the Intelligent Vision System is capable of Identifying, Counting and Sorting various colored objects placed in the workspace. The Controller accepts the position of the object detected by the Vision System as input and generates a motion command which actuates the Robotic joints (actuators/motors). Kinematic Analysis of the Robot was done and the robot trajectory was planned in the joint space using cubic spline. The user has the feasibility to select the desired object to be picked and can also operate the robot manually using the user panel. The system developed is rugged and prevents direct user interaction with the robot ensuring the safety of the operating robotic system.

The proposed new low cost robotic exhibits would include:
A robot fixed on a work table with links and end effectors fitted with a gripper. The robot is connected with an intelligent vision system to perform a number of interesting tasks:

1. **Identification of Characters**: A number of cubes/blocks are present in the workspace with alphabets imprinted on them. User would enter their names or any word of their choice on the user panel. The intelligent vision system identifies the letters printed on the blocks and guides the robot to arrange the blocks in the order to form the word specified by the user.
2. **Identification of pictures of animals**: Vision system of the robot learns the pictures of different animals printed on blocks. Robot would identify and recognize different animals and picks up the pictures of animal which the user specifies.
3. **Identification of Leaves:** Leaves of medicinal plants is learnt by a robot. User inputs the name of a medicine. The robot picks up the corresponding leaf and tells the name of the plant and its medicinal value.
4. **Learning to do Arithmetic Operations**: Robot learns numbers from 0 to 9 and can perform simple arithmetic operations (add, subtract and multiply) as specified by the user and displays the results in the workspace by arranging the blocks.
5. **Robot welcome Visitors**: A small robot system can be developed which waves at a visitors in the vicinity of the setup. The Vision system detects and tracks the visitor continuously while the robot follows the human motion and waves at him.