WHAT IS CLAIMED IS:

1. An autonomous mobile robot having robot arm with multiple degrees of freedom for riding an elevator without communication ability, comprising:

a control unit, configured to receive a task instruction for performing a task at a target floor and generate a control signal comprising floor information of the target floor;

a sensing and perception unit, configured to obtain sensing data and provide a perception result indicative of an object related to the elevator from the sensing data according to the control signal, wherein the sensing and perception unit comprises a sensing module configured to obtain one or more images and a perception module configured to identify the object in the one or more images;

a cognition unit, configured to derive position and orientation of the object relative to the autonomous mobile robot; and

an actuator unit, having multiple joints and an end effector in at least 3 degrees of freedom, wherein the multiple joints comprise a first joint for panning, a second joint for tilting or rotating, and a third joint for extending or rotating, wherein the third joint is configured to drive the end effector connected thereto to perform an operation with the object, wherein the first joint and the sensing module are disposed adjacent to each other on a top surface of the autonomous mobile robot;

wherein the control unit is further configured to send a control command comprising position and orientation information to the actuator unit, and the actuator unit is configured to receive and execute the control command to perform the operation with the object by the end effector.

2. The autonomous mobile robot having robot arm with multiple degrees of freedom according to claim 1, wherein the sensing module is further

configured to obtain one or more images containing a control panel of the elevator, and the perception unit is further configured to identify a button on the control panel of the elevator according to the floor information.

3. The autonomous mobile robot having robot arm with multiple degrees of freedom according to claim 1, wherein the position and orientation information comprises a vertical coordinate, a horizontal coordinate and an orientation angle of the object.

4. The autonomous mobile robot having robot arm with multiple degrees of freedom according to claim 1, wherein the end effector is driven through the multiple joints, and at least two of the multiple joints are configured to perform motions through a single dual-axis motor.

5. The autonomous mobile robot having robot arm with multiple degrees of freedom according to claim 1, wherein the end effector is driven to perform the operation with the object in a perpendicular angle.

6. The autonomous mobile robot having robot arm with multiple degrees of freedom according to claim 1, wherein the end effector comprises a tip, and the tip is detachable, replaceable, deformable, soft or anti-abrasion.

7. The autonomous mobile robot having robot arm with multiple degrees of freedom according to claim 1, wherein the actuator unit further comprises a tactile feedback sensor integrated with the end effector for providing feedback to the control unit.

8. The autonomous mobile robot having robot arm with multiple degrees of freedom according to claim 1, wherein the autonomous mobile robot is configured to navigate by 2D spatial positioning and is configured to sense and perform the operation with the object at a fixed location.

9. An autonomous mobile robot having robot arm with multiple degrees of freedom for riding an elevator without communication ability, comprising:

a control unit, configured to receive a task instruction for performing a task at a target floor and generate a control signal comprising floor information of the target floor;

a sensing and perception unit, configured to obtain sensing data and provide a perception result indicative of an object related to the elevator from the sensing data according to the control signal;

a cognition unit, configured to derive position and orientation of the object relative to the autonomous mobile robot; and

an actuator unit, having multiple joints and an end effector in at least 3 degrees of freedom, wherein the multiple joints comprise a first joint for panning, a second joint for tilting or rotating, and a third joint for extending or rotating, wherein the third joint is configured to drive the end effector connected thereto to perform an operation with the object, wherein the multiple joints further comprise an additional joint for extending vertically and the additional joint is connected to the first joint;

wherein the control unit is further configured to send a control command comprising position and orientation information to the actuator unit, and the actuator unit is configured to receive and execute the control command to perform the operation with the object by the end effector.