



**ARAB ACADEMY FOR SCIENCE, TECHNOLOGY
AND MARITIME TRANSPORT
(AASTMT)**

**College of Engineering and Technology
Department of Electrical and Control Engineering**

**TRAJECTORY CONTROL OF A CAR-LIKE ROBOT
WITH BACK TRAILER**

By

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Abstract:

This thesis proposes a novel control system for a car like wheeled mobile robot with back trailer. The system consists of two platforms; the front car platform(C) and the trailer platform(T). The main objective is to control the Trailer platform using the actuators found in the front platform(C). The mobility of the platform(C) is investigated and inverse and forward kinematics model is obtained for both platforms (C) and (T).

The kinematics analysis of the front car shows the singularity problem of the system, which is expressed by means of non-holonomic constraints. Virtual new actuated kinematics are developed to overcome this problem. The control system is divided into three cascaded controllers. Firstly an axes level control for actuators to insure the performance of the wheel velocities. Secondly, a controller based kinematics is established on the front platform(C). Thirdly, a trajectory control for the trailer trajectory using proportional controller technique.

The system is simulated using Matlab M-file and the simulation examples results illustrated the system performance. The system is constructed with a hardware setup for the front and trailer platform. The hardware experimental results and the simulated examples outputs showed the validation of the hardware setup.

Finally, the proportional controller results show the accuracy of the system with a very small accepted error (1%) which is an acceptable value for such system.