

การควบคุมแรงขับเคลื่อนของหุ่นยนต์สำรวจที่ใช้กลไกแบบ ROCKER-BOGIE

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วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาวิศวกรรมศาสตรดุษฎีบัณฑิต

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TRACTION CONTROL OF A ROCKER-BOGIE FIELD MOBILE ROBOT

Mr.Mongkol Thianwiboon

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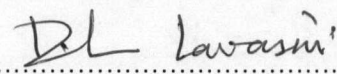
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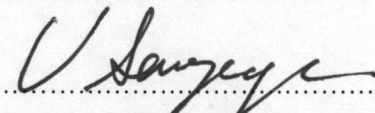
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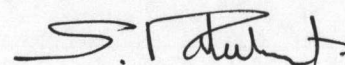
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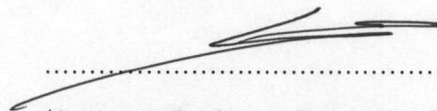
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งานวิจัยนี้อธิบายถึงการหาแบบจำลองสมการการเคลื่อนที่ของหุ่นยนต์สำรวจหกล้อที่ใช้
กลไกแบบ Rocker-Bogie โดยสมการการเคลื่อนที่ไปข้างหน้าคำนวณจาก Wheel Jacobian
Matrices ประกอบกับการประมาณมุมสัมผัสระหว่างล้อกับพื้น หลังจากนั้นทำการคำนวณสมการ
การเคลื่อนที่ผกผันเพื่อใช้คำนวณหาความเร็วเชิงมุมของแต่ละล้อและมุมเลี้ยว จากความเร็วและ
ทิศทางของหุ่นยนต์ที่ต้องการเคลื่อนที่ นอกจากนั้นระบบควบคุมแรงขับเคลื่อนได้ถูกพัฒนาขึ้นเพื่อ
ลดการสิ้นเปลืองของล้อและเพิ่มแรงขับเคลื่อนให้มีความมากที่สุด โดยเปรียบเทียบข้อมูลจากอุปกรณ์
ตรวจวัดที่ติดตั้งอยู่บนตัวหุ่นยนต์ กับความเร็วของแต่ละล้อ

การทดสอบแบ่งเป็นสามส่วน ส่วนแรก คือ การทดสอบความผิดพลาดในการเคลื่อนที่ของ
หุ่นยนต์ อันประกอบด้วย การทดสอบในแนวเส้นตรง การเคลื่อนที่ในแนวเส้นโค้ง และการหมุนรอบ
ตัวเอง ส่วนที่สอง เป็นการทดสอบระบบควบคุมแรงขับเคลื่อนโดยใช้แบบจำลองในคอมพิวเตอร์
และส่วนท้าย ทำการทดสอบหุ่นยนต์ที่ใช้ระบบควบคุมแรงขับเคลื่อนดังกล่าวในพื้นที่ผิวลักษณะต่างๆ

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A method for kinematics modeling of a six-wheel Rocker-Bogie mobile robot is described in detail. The forward kinematics is derived by using wheel Jacobian matrices in conjunction with wheel-ground contact angle estimation. The inverse kinematics is to obtain the wheel velocities and steering angles from the desired forward velocity and turning rate of the robot. Traction control also developed to improve traction by comparing the information from onboard sensors and wheel velocities to minimize slip of the wheels.

The experiments divided into three sections. First, the experiment was set up to measure the motion error, consist of linear motion (forward-backward), turning around a point and rotation in place. Second, the traction control system was verified by simulation. Finally, a small robot with traction control system was tested in varied conditions of surfaces including vertical obstacles with various heights, inclined surfaces and uneven terrain outdoor condition.

Department.....Mechanical Engineering.. Student's signature..... *Mongkol Thianwiboon*
 Field of study.....Mechanical Engineering.. Advisor's signature..... *Viboon Sangveraphunsiri*
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