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COMPUTATION OF FORCE CLOSURE GRASPS FROM FINITE CONTACT POINT SET

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A Dissertation Submitted in Partial Fulfillment of the Requirements
for the Degree of Doctor of Philosophy Program in Computer Engineering

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Faculty of Engineering

Chulalongkorn University


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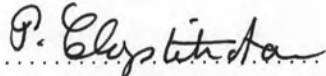
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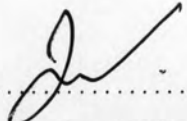

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การจับวัตถุแบบมั่นคงนั้นจะเกิดขึ้นเมื่อการจับวัตถุมีคุณสมบัติการปิดของแรง การจับแบบปิดของแรงระบุว่าการจับนั้นสามารถต้านทานแรงรบกวนภายนอกที่มากระทำกับวัตถุได้ งานวิจัยชิ้นนี้พิจารณาปัญหาการจับแบบปิดของแรงในสองประเด็น คือประเด็นการใช้จุดสัมผัสแบบเซตจำกัด และประเด็นในการคำนวณผลการจับแบบปิดทั้งหมดที่เป็นไปได้ของวัตถุ ทั้งสองประเด็นนี้ไม่เคยถูกพิจารณาร่วมกันมาก่อนในงานวิจัยอื่น ๆ โดยทั้งสองประเด็นดังกล่าวเป็นเรื่องที่สำคัญมากในการจับวัตถุที่เราไม่ทราบแบบจำลองล่วงหน้า งานวิจัยชิ้นนี้ได้นำเสนอขั้นตอนวิธีหลายขั้นตอนวิธีสำหรับแก้ปัญหาดังกล่าวในสภาพการณ์ต่าง ๆ โดยแบ่งตามการมีอยู่ของแรงเสียดทานและ มิตติของวัตถุที่ทำการจับ นอกจากนี้งานวิจัยชิ้นนี้ยังได้ทำการเปรียบเทียบขั้นตอนวิธีที่ได้นำเสนอกับขั้นตอนวิธีอื่น ๆ ที่ปรากฏอยู่แล้วในงานวิจัยอื่น ๆ โดยการเปรียบเทียบนั้นได้พิจารณาในมุมของความเร็วและความแม่นยำของขั้นตอนวิธีผลการเปรียบเทียบระบุว่าขั้นตอนวิธีที่ได้นำเสนอนั้นมีความเร็วและความแม่นยำดีกว่าขั้นตอนวิธีอื่น ๆ

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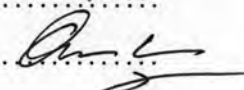
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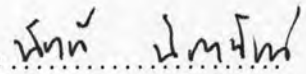
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NATTEE NIPARNAN : COMPUTATION OF FORCE CLOSURE GRASPS FROM FI-
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An object is securely grasped when the grasp achieves force closure. The force closure property indicates that a grasp can balance any external disturbance exerted on the object. This work addresses the problem of form closure grasp synthesis in two novel aspects: the representation of the object by discrete contact points and the need to compute all force closure grasps of an object. This two aspects are very crucial for grasping in an unsupervised workspace. Several algorithms are presented to solve this problem in four specific settings which are classified by the presence of friction and the dimensions of the objects. Empirical comparisons between the proposed algorithms and existing algorithms are conducted. The comparisons focus on speed and accuracy of the algorithms. It is shown that the presented algorithms outperform existing algorithms in both aspects.

DepartmentComputer Engineering.....

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