INTERACTIVE MOTION PLANNING WITH CONTACT

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sous la direction de

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1 Introduction

2 Interactive Motion Planning

3 Contact Planning

4 Tests

5 Conclusion
1 Introduction

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INTRODUCTION

Context: Product Lifecycle management (PLM)
- Assembly
- Disassembly
- Maintenance

Virtual Reality (VR)
- Automatisation
- Costs reduction
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MOTION PLANNING

Different Methods

- Determinist algorithms
- Probabilistic Algorithms: PRM, RRT
- Interactive Motion Planning

Contribution

- RRT-based Interactive Motion Planning algorithm with Contact Sampling on obstacles
# INTRODUCTION

## MOTION PLANNING

### Different Methods

- Determinist algorithms
- Probabilistic Algorithms: PRM, RRT
- Interactive Motion Planning

### Contribution

- RRT-based Interactive Motion Planning algorithm with Contact Sampling on obstacles
INTERACTIVE MOTION PLANNING

SUMMARY

1. Introduction
2. Interactive Motion Planning
3. Contact Planning
4. Tests
5. Conclusion
Interaction between an operator and an RRT
Algorithm 1 Interactive Motion Planning

1: loop
2: \( a \leftarrow \text{rand}(0, 1) \)
3: if \( a > \alpha \) then
4: \( q_{\text{current}} \leftarrow q_{\text{device}} \)
5: \( T \leftarrow \text{Add}_{\text{Tree}}(q_{\text{current}}) \)
6: else
7: \( q_{\text{current}} \leftarrow \text{Random}_{\text{Shooter}}() \)
8: \( T \leftarrow \text{Add}_{\text{Tree}}(q_{\text{current}}) \)
9: end if
10: end loop
CONTACT PLANNING

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CONTACT PLANNING

Interaction between RRT and an operator

Variables
- $n$ is the normal vector to surface $\Pi$
- $\delta$ is the distance from $P_n$ to $P_c$ along $n$
CONTACT PLANNING

MOTION PLANNING WITH INTERACTION AND CONTACT

1: loop
2: \((P_o, P_n) = \text{Find}_\text{Nearest}_\text{Obstacle}(q_{\text{device}})\)
3: \(a \leftarrow \text{rand}(0, 1)\)
4: if \(a > \alpha\) then
5: if \(|P_c - P_n| \geq d\) then
6: \(q_{\text{current}} \leftarrow q_{\text{device}}\)
7: \(T \leftarrow \text{Add}_\text{Tree}(q_{\text{current}})\)
8: else
9: \(\text{ContactSampling}(P_o, P_n, N, q_{\text{device}})\)
10: end if
11: else
12: \(q_{\text{current}} \leftarrow \text{Random}_\text{Shooter}()\)
13: \(T \leftarrow \text{Add}_\text{Tree}(q_{\text{current}})\)
14: end if
15: end loop
CONTACT PLANNING

EXAMPLE: TWO SUCCESSIVE CONTACTS
TESTS
SUMMARY

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EXAMPLE SPACE: MAZE

Simple RRT:

Interactive RRT:
Environment:

Start

Goal

Simple RRT:
Tests

Influence of Alpha

\( \alpha = 0.8 \)

\( \alpha = 0.2 \)

\( \alpha = 0.05 \)
Tests
Very Constrained Environment

Start
Narrow passage
Cluttered space
Goal
Path
CONCLUSION

SUMMARY

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New Path planning method

- Interactive guidance
- Contact Sampling

Future work

- Randomly change orientation
- Follow different contacts
Merci !

Thank you!