Supporting Robotic Deliberation: 
The Deliberation Working Group and Tools for Behavior Trees
Christian Henkel, Bosch Research
ROSCon 2023
The programmer may return to being a mathematician. He is supplied with a catalogue of subroutines. No longer does he need to have available formulas or tables of elementary functions. He does not even need to know the particular instruction code used by the computer. He needs only to be able to use the catalogue to supply information to the computer about his problem. The UNIVAC, on the basis of the information supplied by the mathematician,
1200

Started Cosine Tape (Sine check)

Relays 6-2 in 033 failed special speed test

In Relays.

1525

Started Multiply Adder Test.

1545

First actual case of bug being found.

9.037846995 conv

2.130476415 (2)

4.615925059 (2)

Relay #70 Panel F

(moth) in relay.

7:30 A.M. started.

1700 closed down.
Deliberation Working Group
Deliberation Working Group

Convince Project

Convince Project

Funded by the European Union

Real World Physics

Skills
- Device drivers
- Operating System(s)
- Computing Hardware
- Sensors
- Actuators

Management
- UI, app, fleet management, manufacturing control, ...

Deliberation
- Task planning, task control, behaviors, ...

Object recognition, human tracking, SLAM, motion planning and control, grasping, navigation, ...

Management
- Task planning, task control, behaviors, ...

Device drivers
- Operating System(s)
- Computing Hardware
- Sensors
- Actuators

Real World Physics

Partners

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Deliberation Working Group

Welcome Page

Networking and knowledge exchange

Discussion of novel and advanced works on top of the state of the art

Streamlining & harmonization of common interfaces

More information

- To participate: [https://groups.google.com/g/ros-wg-deliberation](https://groups.google.com/g/ros-wg-deliberation)
- Recordings: [https://www.youtube.com/playlist?list=PLcSZ3QEfKf-CKfrcbtUehY4U1brNabnf](https://www.youtube.com/playlist?list=PLcSZ3QEfKf-CKfrcbtUehY4U1brNabnf)

The ROS Deliberation Working Group

This document contains agenda and protocol of the Deliberation Working Group

Lead(s)
Christian Henkel
Contact: [Christian.Henkel0@de.bosch.com](mailto:Christian.Henkel0@de.bosch.com)

Meeting Invitation
If you want to receive an invitation to the working group meetings, please join [ros.wg.deliberation](https://groups.google.com/g/ros-wg-deliberation).

Working mode
Please add points that you want to discuss to the agenda, and please add points that we discussed during the meeting.

Access rights
All members of [ros.wg.deliberation](https://groups.google.com/g/ros-wg-deliberation) have rights to suggest changes. If you are attending the meeting regularly and would like to help me moderate the changes, I can give you edit rights. But for security reasons, I don’t want to give them to all group members by default.

Recordings
We try to record all meetings. You will find the recordings here: [https://www.youtube.com/playlist?list=PLcSZ3QEfKf-CKfrcbtUehY4U1brNabnf](https://www.youtube.com/playlist?list=PLcSZ3QEfKf-CKfrcbtUehY4U1brNabnf)

Index (clickable)
(Next meetings are on the top of the list)
- 23-10-02
- 23-08-02
- 23-07-03
- 23-06-05
- 23-04-28
Deliberation Working Group
Technologies Word Cloud

Working Group

Our first product: Awesome Deliberation

- Our first Product is a list of robotics deliberation
  - Packages
  - Presentations
  - Publications

- Feel free to contribute:
  - https://github.com/ros-wg-delib/awesome-ros-deliberation

- Next steps
  - Standardization of behavior tree nodes
Deliberation Working Group

Some Presentations

Deliberate and Act with PlanSys2, Francisco Martin Rico, Universidad Rey Juan Carlos

AIPlan4EU and Planning with Behavior Trees, Guglielmo Gemignani, Magazino GmbH

BehaviorTree.CPP: what makes it different from other implementations, Davide Faconti

Integrated Task and Motion Planning with ROS 2 and PDDLStream, Sebastian Castro

Different behavior tree formalisms, Enrico Ghiorzi, Università di Genova

Deliberation at NODE - Quirks and Features, Jannik Abbenseth, NODE Robotics
Tooling for Behavior Trees
Tooling for Behavior Trees
A toolkit for the Behavior Tree Tender

bt_tools
A python library and multiple tools to visualize and analyze behavior trees created with behaviortree.cpp

https://github.com/boschresearch/bt_tools
Tooling for Behavior Trees

Offline analysis: bt_view

ros2 run bt_view bt_view --
bt_log_fbl_fnames <path_to_fbl_log> --
coverage-threshold <threshold>

https://github.com/boschresearch/bt_tools
Tooling for Behavior Trees

Online Visualization: bt_live

https://github.com/boschresearch/bt_tools
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• Awesome list: [https://github.com/ros-wg-delib/awesome-ros-deliberation](https://github.com/ros-wg-delib/awesome-ros-deliberation)

BT Tools
• Github: [https://github.com/boschresearch/bt_tools](https://github.com/boschresearch/bt_tools)

Christian Henkel
christian.henkel2@de.bosch.com | github.com/ct2034