

New Developments for Robert

Assisting Novice Users Even Better in DIY Projects

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ulm university universität
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BOSCH



Do-It-Yourself Projects



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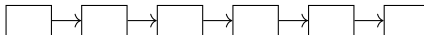
Do-It-Yourself Projects



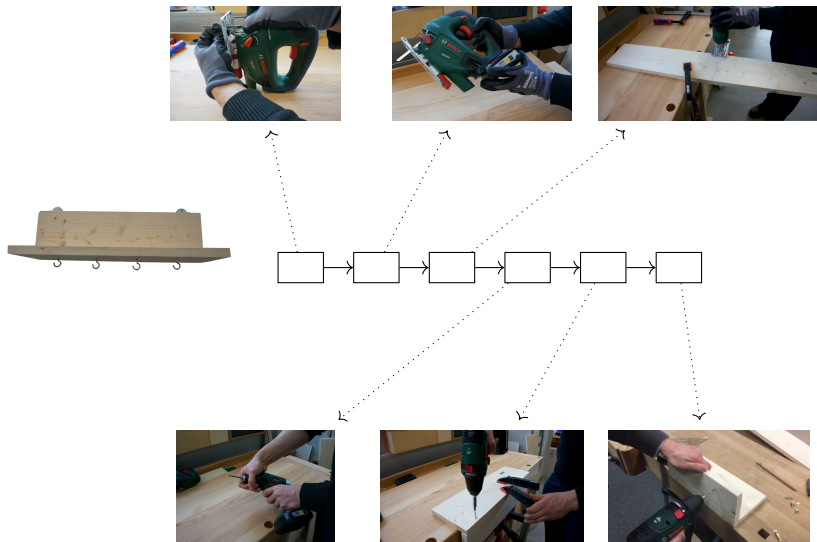
Assisting DIYers



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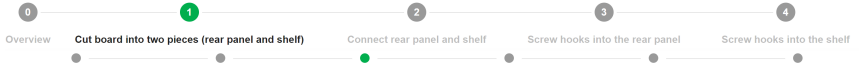
Assisting DIYers



Assistance delivered by Robert

**BOSCH**

Logout



**1.3****INSERT SAW
BLADE**

If necessary, remove the cover hood of the **PST18Li**. Put on gloves (risk of injury). Push the **saw blade holder** upwards in the direction of the arrow. Slide the **wood saw blade** with the teeth in the cutting direction


[▶ VIDEO](#)[👁 OVERVIEW](#)[↑ LESS INFORMATION](#)[🔄 INSTRUCTIONS WITH MANUAL SAW](#)

Insert your request here.

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0 Overview 1 **Cut board into two pieces (rear panel and shelf)** 2 Connect rear panel and shelf 3 Screw hooks into the rear panel 4 Screw hooks into the shelf



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[👁 OVERVIEW](#)

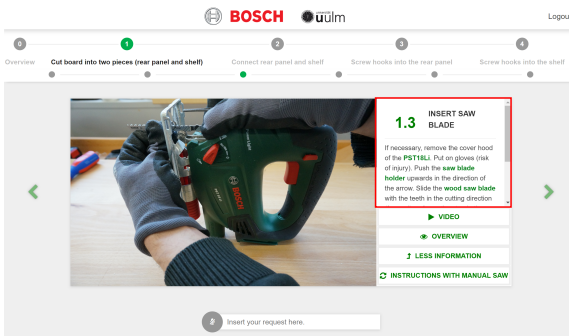
[↑ LESS INFORMATION](#)

[🔄 INSTRUCTIONS WITH MANUAL SAW](#)

 Insert your request here.



- Actions are presented as

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- Actions are presented as
 - Text

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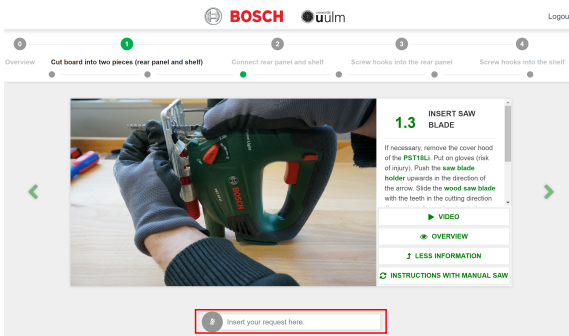
- Actions are presented as
 - Text
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Assistance delivered by Robert

The screenshot displays the Robert assistance interface. At the top, there are logos for Bosch and the University of Freiburg, and a 'Logout' link. Below this is a progress bar with five steps: 0 Overview, 1 Cut board into two pieces (rear panel and shelf), 2 Connect rear panel and shelf, 3 Screw hooks into the rear panel, and 4 Screw hooks into the shelf. Step 1 is currently active. The main content area shows a video of a person using a green Bosch circular saw to cut a piece of wood. To the right of the video, there is a text instruction titled '1.3 INSERT SAW BLADE'. The text reads: 'If necessary, remove the cover hood of the PST18Li. Put on gloves (risk of injury). Push the saw blade holder upwards in the direction of the arrow. Slide the wood saw blade with the teeth in the cutting direction'. Below the text, there are four buttons: 'VIDEO' (highlighted with a red border), 'OVERVIEW', 'LESS INFORMATION', and 'INSTRUCTIONS WITH MANUAL SAW'. At the bottom of the interface, there is a search bar with the placeholder text 'Insert your request here.'

- Actions are presented as
 - Text
 - Images
 - Videos

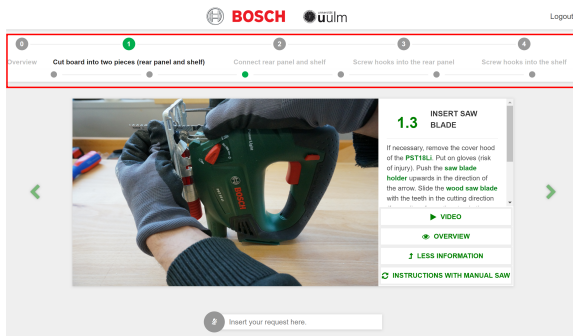
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- Actions are presented as
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- Interaction via speech and touch

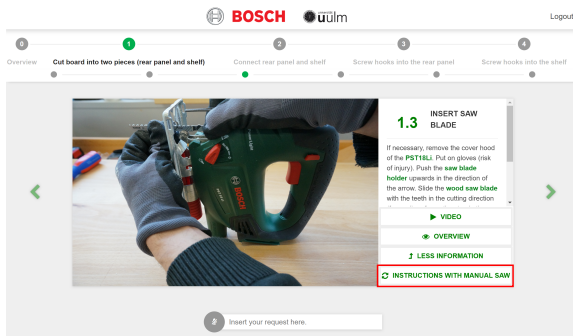
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- Actions are presented as
 - Text
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- Interaction via speech and touch
- HTN domain provides useful abstraction

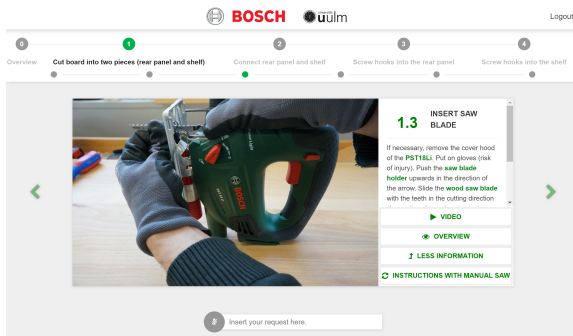
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- Actions are presented as
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- Interaction via speech and touch
- HTN domain provides useful abstraction
- Allows changes to the presented plan

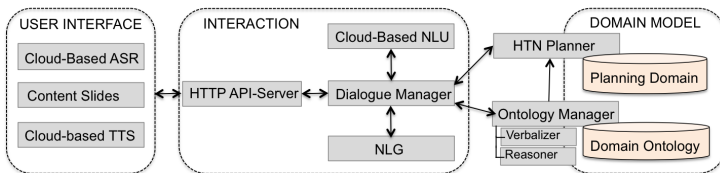
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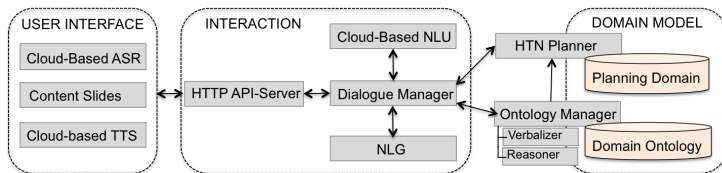
- Interaction via speech and touch
- HTN domain provides useful abstraction
- Allows changes to the presented plan
- Proactivity using Connected Tool

Robert's components



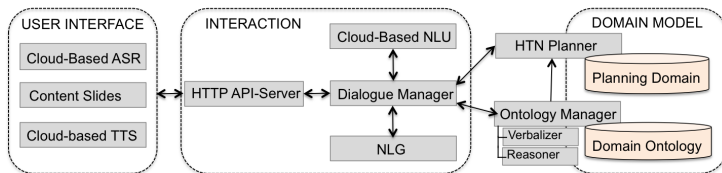
- (HTN-)Planner

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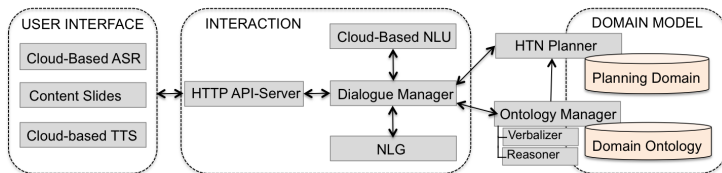
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Robert's components



- (HTN-)Planner
- Ontology Manager
- Dialogue Manager

Robert's components



- (HTN-)Planner
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- Dialogue Manager
- User Interface

Changing the Plan

The user might not like the presented plan!

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VS



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VS



- We can't know the user's preference in beforehand.

Changing the Plan

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VS



- We can't know the user's preference in beforehand.
- ⇒ React to the user's wishes.

Changing the Plan

- Receive request from the user

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U: I want to use the manual saw instead of the electric one.

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What about inconsistencies?

\Rightarrow If $\neg \exists \pi : \pi \models \bigwedge \phi_i$, drop the oldest one

Connected Tool



Connected Tool



- Sensors to PSR18Li
 - Gyroscopic
 - Accelerometric
 - Compass

Connected Tool



- Sensors to PSR18Li
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- Trained Neural Network using data from 12 subjects

Connected Tool



- Sensors to PSR18Li
 - Gyroscopic
 - Accelerometric
 - Compass
- Trained Neural Network using data from 12 subjects
- Recognise Activities
 - off
 - screwing
 - drilling
 - drill change
 - battery change
 - other

Proactivity

We now know what the user is doing!

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- ⇒ Help the user complete his project with suitable dialogue strategies
 - Inform the user of the connected tool
- R:** You seem to be working with the connected tool for the first time. Don't worry, I'll guide you through the steps!

Proactivity

We now know what the user is doing!

- ⇒ Help the user complete his project with suitable dialogue strategies
- Inform the user of the connected tool
- Supportive questions

R: I noticed that you were drilling. Did that work?

U: No, it didn't.

R: Ok, do you need additional help?

U: Yes, please.

R: A video of this project step could help. I'm going to play it for you.

(Then a video is played.)

Proactivity

We now know what the user is doing!

- ⇒ Help the user complete his project with suitable dialogue strategies
- Inform the user of the connected tool
 - Supportive questions
 - Handle inactivity

R: I haven't seen any tool activity by you in three minutes. Do you need help?

U: ...

Eval

We evaluated **changing the plan** and **proactivity**

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Results:

- Overall verdict better with proactivity: 3.38/5 vs 3.14/5, but not significant
- 19 subjects used the change feature
- Change was performed according to expectations: 4.29/5