

# Behavior Trees

Behavior trees are a formal, graphical modelling language used primarily in systems and software engineering. Behavior trees employ a well-defined notation to unambiguously represent the hundreds or even thousands of natural language requirements that are typically used to express the stakeholder needs for a large-scale software-integrated system.

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Level of education: Bachelor

# Technology Impact Cycle Tool

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## Impact on society

What impact is expected from your technology?

### What is exactly the problem? Is it really a problem? Are you sure?

The purpose of behavior trees is to easily and organically graph out behavior of a piece of software. This improves workflow and makes decision trees better to read.

### Are you sure that this technology is solving the RIGHT problem?

Behavior trees are not made to completely replace programming. It's a useful tool to design the to be programmed decision making code.

### How is this technology going to solve the problem?

By abiding to a pre-defined standard when designing it will be possible to easily display how a decision in your program is made.

### What negative effects do you expect from this technology?

When implementing BT's in an already existing codebase it is possible that some of the code has to be rewritten to fit the constraints of Behavior Trees.

### In what way is this technology contributing to a world you want to live in?

Behavior trees will lower the barrier of entry for programmers to start scripting decision making. This will get more people into STEM related studies and jobs.

### Now that you have thought hard about the impact of this technology on society (by filling out the questions above), what improvements would you like to make to the technology? List them below.

It would be good to implement a code template generator or a visual code editor for a tool like groot where you need to double click on different BT nodes and you can fill in what it does in actual code. This way it is easier to understand how the code is structured.

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## Hateful and criminal actors

What can bad actors do with your technology?

*This category is not applicable for this technology.*

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## Privacy

Are you considering the privacy & personal data of the users of your technology?

*This category is not applicable for this technology.*

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## Human values

How does the technology affect your human values?

### How is the identity of the (intended) users affected by the technology?

The technology does not affect the identity of the user.

### How does the technology influence the users' autonomy?

The user may have to follow certain standards to create a valid Behavior Tree and its program. This somewhat limits you in what you can do and how you can implement it.

### What is the effect of the technology on the health and/or well-being of users?

The technology does not have impact on the health and/or well-being of the user. Unless you count brain damage due to stress.

### Now that you have thought hard about the impact of your technology on human values, what improvements would you like to make to the technology? List them below.

The technology could do with a sort of custom node you can program anything you want into. You'll just need to declare when the node runs.

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## Stakeholders

Have you considered all stakeholders?

*This category is only partial filled.*

**Who are the main users/targetgroups/stakeholders for this technology? Think about the intended context by answering these questions.**

**Name of the stakeholder**

Programmer

**How is this stakeholder affected?**

The programmer is going to make use of this technology and is implementing it into new or existing software. Depending on what is required this may take a lot of time and energy.

**Did you consult the stakeholder?**

Yes

**Are you going to take this stakeholder into account?**

Yes

**Did you consider all stakeholders, even the ones that might not be a user or target group, but still might be of interest?**

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**Now that you have thought hard about all stakeholders, what improvements would you like to make? List them below.**

There would need to be a way to make the implementation into existing projects easier. Not entirely sure how that would work though.

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## Data

Is data in your technology properly used?

*This category is not applicable for this technology.*

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## Inclusivity

Is your technology fair for everyone?

*This category is not applicable for this technology.*



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## Transparency

Are you transparent about how your technology works?

### **Is it explained to the users/stakeholders how the technology works and how the business model works?**

Due to the way the graphing works it's very easy to explain what the pathing is for a program. If it allowed, the behavior tree would be very easy to explain to non-it-specialists.

### **If the technology makes an (algorithmic) decision, is it explained to the users/stakeholders how the decision was reached?**

Depending on how the diagram for the Behavior Tree is designed it can be. Comments can be placed around the nodes and the code itself can be commented aswell.

### **Is it possible to file a complaint or ask questions/get answers about this technology?**

Completely depends on the implementation.

### **Is the technology (company) clear about possible negative consequences or shortcomings of the technology?**

Completely depends on the implementation and what is being implemented.

### **Now that you have thought hard about the transparency of this technology, what improvements would you like to make? List them below.**

A program like groot would benefit from a commenting system when making the diagrams.

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## Sustainability

Is your technology environmentally sustainable?

*This category is not applicable for this technology.*

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## Future

Did you consider future impact?

### **What could possibly happen with this technology in the future?**

The technology can be expanded to allow more features, this has to trickle down to libraries that implement this logic into different kinds of programming languages. The amount of users will increase and community implementations will start to show up.

**Sketch a or some future scenario (s) (20-50 years up front) regarding the technology with the help of storytelling. Start with at least one utopian scenario.**

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**Sketch a or some future scenario (s) (20-50 years up front) regarding the technology with the help of storytelling. Start with at least one dystopian scenario.**

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**Would you like to live in one of this scenario's? Why? Why not?**

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### **What happens if the technology (which you have thought of as ethically well-considered) is bought or taken over by another party?**

It could be possible that the technology is monetized or a tool that's used to make Behavior Trees (like groot) is privatized and monetized. Hopefully the amount of people using it will cause a ruckus and the free version of the tools are reinstated or an alternative will be created.

**Impact Improvement: Now that you have thought hard about the future impact of the technology, what improvements would you like to make? List them below.**

It would be good to make community built well licensed software so it cannot be made proprietary. This way the technology stays developer focused and the implementation steps should become easier.