

# Behavior Trees for Culturally Sensitive Social Robots: African Culture Case Study

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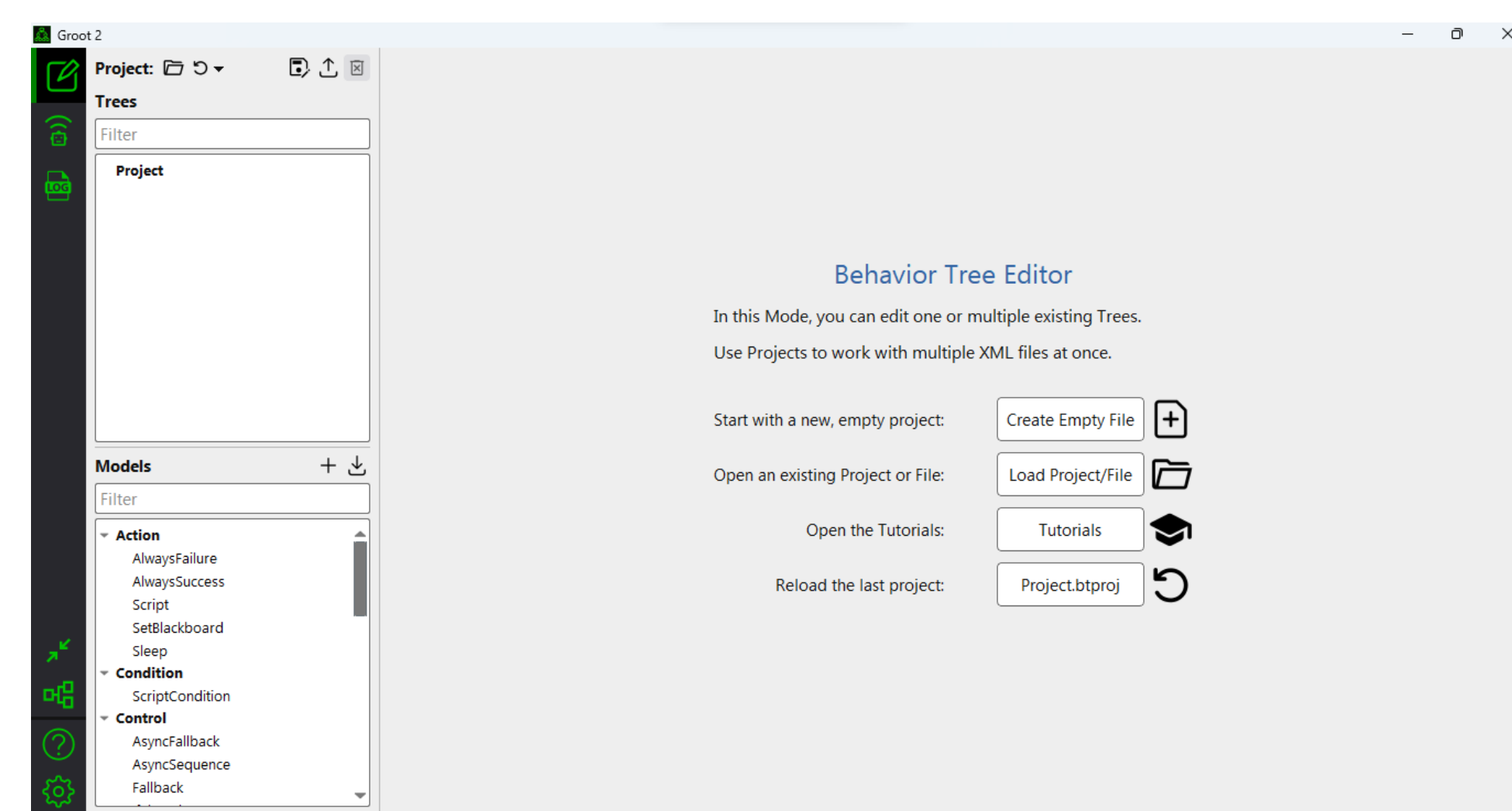
## Overview

The goal of this project is to explore the use Behavior Trees to implement robot missions for a culturally sensitive social robot in Africa.

Cultural sensitivity in social robots' interaction is essential for fostering trust, ensuring respectful interactions, and enhancing user experiences. However, developing robots that can dynamically adapt to different cultural norms presents significant challenges.

Behavior Trees (BTs) were invented as a tool to enable modular AI in computer games but have received an increasing amount of attention in the robotics community in the last decade. Compared to other approaches, such as hierarchical finite state machines, they have clear advantages in terms of modularity, reusability or expandability. By developing a comprehensive and up-to-date cultural knowledge database and integrating these cultural norms into behavior trees and enabling dynamic adaptation, robots can achieve a higher level of cultural competence.

## Frameworks and Tools



Groot2 – IDE for designing Behavior Trees

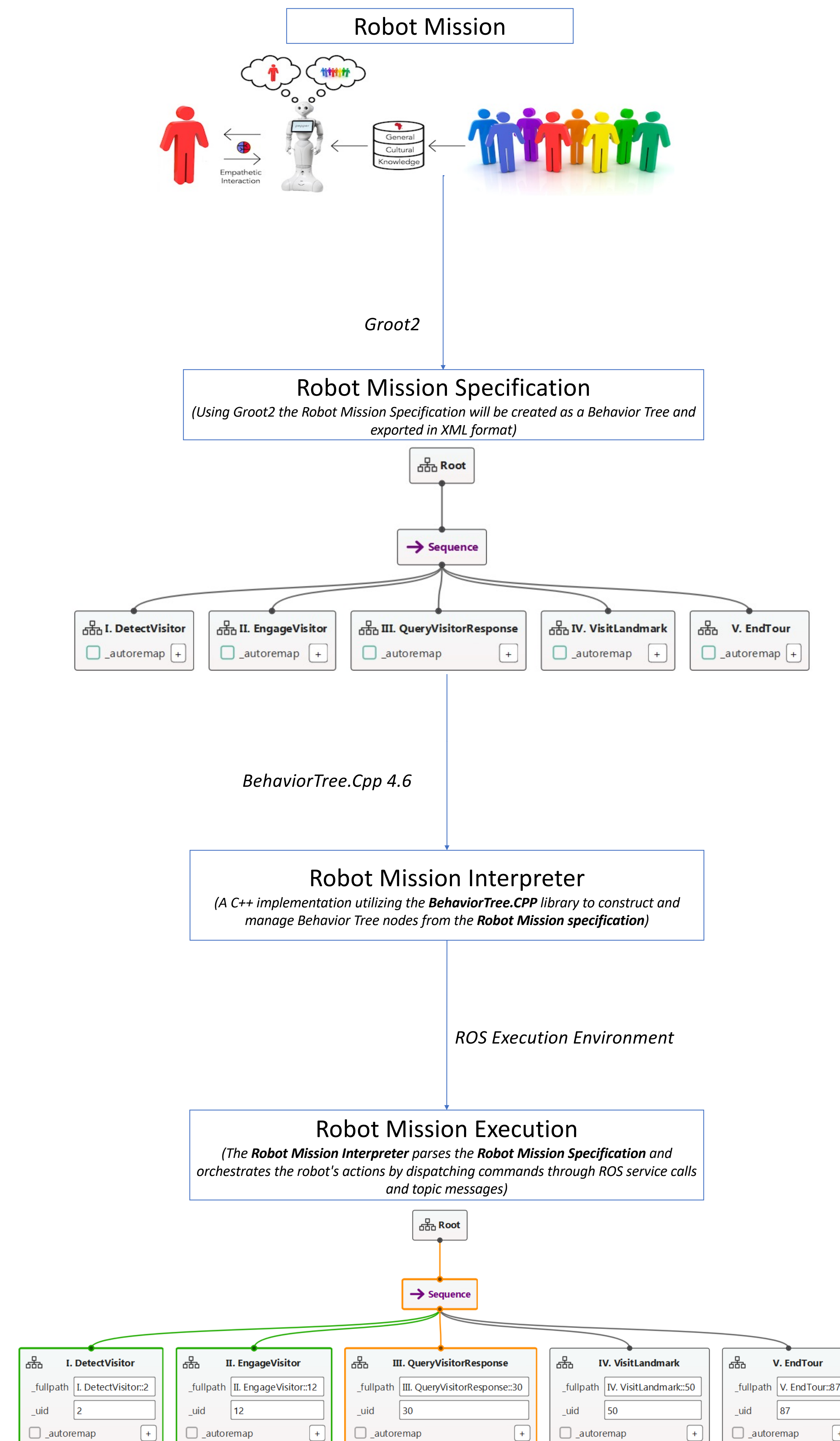


## BehaviorTree.CPP 4.6

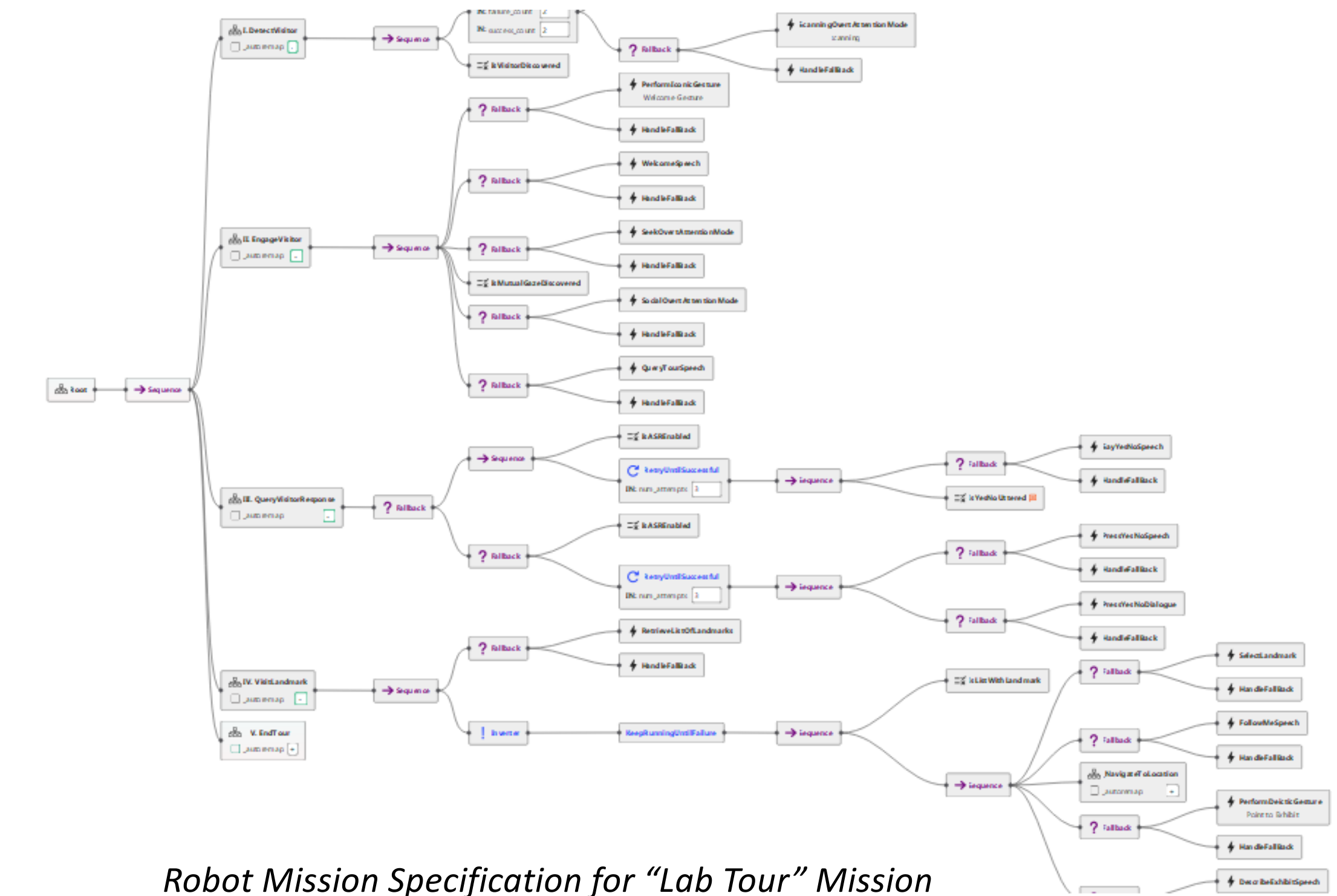
The C++ library to build Behavior Trees.  
Batteries included.

BehaviorTree.CPP 4.6 – library for implementing Robot Mission Interpreter

## Methodology



## Preliminary Results



Robot Mission Specification for "Lab Tour" Mission

```

vboxuser@U20: ~/bts
I'm Pepper, your friendly robot tour guide.
[ INFO] [1728548371.447239078]: [/textToSpeech]: Successfully performed speech synthesis
[ INFO] [1728548372.436189538]: [/overtAttention]: Set Overt Attention Mode: seek
[ INFO] [1728548374.432786937]: [/overtAttention]: Mode Set to: seek
[ INFO] [1728548382.436286979]: [/overtAttention]: <seek> succeeded
[ INFO] [1728548384.450583881]: [/overtAttention]: Set Overt Attention Mode: social
[ INFO] [1728548386.456858025]: [/overtAttention]: Mode Set to: social
[ INFO] [1728548386.466255799]: [/textToSpeech]: Saying Text: Hello, I'm Pepper, your friendly robot receptionist.
[ INFO] [1728548388.465310939]: [/textToSpeech]: Successfully performed speech synthesis
[ INFO] [1728548388.468256047]: [/textToSpeech]: Saying Text: I can only understand Yes or No
[ INFO] [1728548390.469547881]: [/textToSpeech]: Successfully performed speech synthesis
[ INFO] [1728548390.473475415]: [/KnowledgeBase]: Querying Knowledge Base: list_of_landmarks
[ INFO] [1728548392.475576981]: [/KnowledgeBase]: Successfully Retrieved Information from Knowledge Base
[ INFO] [1728548392.478125128]: [/textToSpeech]: Saying Text: Please follow me.
[ INFO] [1728548394.736443761]: [/textToSpeech]: Successfully performed speech synthesis
[ INFO] [1728548395.458635471]: [/overtAttention]: Set Overt Attention Mode: disabled

vboxuser@U20: ~/bts
[ INFO] [1728548361.395072718]: EnableAnimateBehavior Action Node
[ INFO] [1728548364.401103009]: ScanningOvertAttentionMode Action Node
[ INFO] [1728548366.429350445]: IsVisitorDiscovered Action Node
[ INFO] [1728548366.429426201]: Visitor discovered
[ INFO] [1728548366.429447592]: PerformIconicGesture Action Node
[ INFO] [1728548369.439238006]: WelcomeSpeech Action Node
[ INFO] [1728548371.448001887]: SeekOvertAttentionMode Action Node
[ INFO] [1728548374.436230805]: IsMutualGazeDiscovered Action Node
[ INFO] [1728548382.446978904]: Mutual gaze detected
[ INFO] [1728548383.441093895]: SocialOvertAttentionMode Action Node
[ INFO] [1728548386.457386603]: QueryTourSpeech Action Node
[ INFO] [1728548388.466855810]: IsASREnabled Condition Node
[ INFO] [1728548388.466919229]: SayYesNoSpeech Action Node
    
```

Robot Mission Execution simulation, using stubs and drivers, and without including Cultural Knowledge

### References

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