

# API

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## Behavior Node Type

Name	Description
Composite Node	It has one or more child nodes and controls which child node to update.
Action Node	This is the leaf node. It execute action such as follow player, attack, escape or others you define.
Conditional Node	It has one child node and check the condition whether child is updatable. when having no child, Conditional Node is the leaf node like Action Node.
Decorator Node	It has one child node and will modify the return value according to the return value of the child node

Name	Description
evaluateOnRunning	true : evaluate the condition if the previous status is <a href="#">Status.Running</a> .

## Built In Composite Node

I have prepared several built in Composite Node.

### Sequence

- Updates the child nodes in order from the top.
- Returns failure immediately if the child node returns failure.
- Returns running immediately and calls the child at the next update timing if the child node returns running.
- Returns success if all child nodes return success.

Sequence has following parameter.

Name	Description
abortOnConditionChanged	true: Aborts the running node when a node with a higher priority than the running node becomes infeasible. Specifically, the execution result of <b>Conditional.CanUpdate</b> , which is a descendant of a node with a higher priority than the running node, is used.

## Selector

- Updates the child nodes in order from the top.
- Returns success immediately if the child node returns success.
- Returns running immediately and calls the child at the next update timing if the child node returns running.
- Returns failure if all child nodes return failure.

Selector has following parameter.

Name	Description
abortOnConditionChanged	true: Aborts the running node when a node with a higher priority than the running node becomes executable. Specifically, the execution result of <b>Conditional.CanUpdate</b> , which is a descendant of a node with a higher priority than the running node, is used.

## Parallel

- Updates all child nodes.
- Returns running if any child node returns running.
- Returns failure if any child node returns failure.
- Otherwise, returns success.

## Random

- The child nodes are elected and executed according to the probability based on the uniform distribution.
- Select one for each update. However, if the running status is returned during the last update, the node will continue to run.

## Rotator

- Updates the child nodes in order. Unlike Sequencer, one child node is executed by one update instead of executing all child nodes by one update.
- For example, if there are three child nodes, the first Update will execute the top node, the next Update will execute the second node, and the next Update will execute the third node.
- The next run will run the top node again.
- If a child node returns a running state, it exits without executing subsequent child nodes, and the child node continues to run on the next update.

Rotator has following parameter.

Name	Description
resetOnAbort	It is a flag whether to return the next execution target node from the top when the execution condition of the ancestor Conditional Node changes and the running node is interrupted.

## Create New Behaviors

### Create Action

- Create C# Script and extends `AkiBT.Action`
- Override `OnUpdate` and return status(Success/Running/Failure).
- Override `Awake` called by `AkiBT.BehaviorTree.Awake` if needed.
- Override `Start` called by `AkiBT.BehaviorTree.Start` if needed.
- Override `Abort` to reset field or any state when the parent condition changed..
- Action has Node `gameObject` field with `AkiBT.BehaviorTree` attached.
- Private [SerializeField] field and public field can be set on Behavior Tree editor window.

```
public class Wait : Action
{
    [SerializeField]
    private float waitTime;

    private float elapsedTime = 0.0f;

    protected override Status OnUpdate()
    {
        elapsedTime += Time.deltaTime;
        if (elapsedTime < waitTime)
        {
            return Status.Running;
        }

        elapsedTime = 0.0f;
        return Status.Success;
    }

    // abort when the parent conditional changed on previous status is running.
    public override void Abort()
    {
        elapsedTime = 0.0f;
    }
}
```

### Create Conditional

- Create C# Script and extends `AkiBT.Conditional`

- Override `IsUpdatable` and return result(true/false). when `IsUpdatable` returns update child.
- Override `OnAwake` called by `AkiBT.BehaviorTree.Awake` if needed.
- Override `OnStart` called by `AkiBT.BehaviorTree.Start` if needed.
- Conditional Node has `gameObject` field with `AkiBT.BehaviorTree` attached.
- Private [SerializeField] field and public field can be set on Behavior Tree editor window.

```
public class IsHateGt: Conditional
{
    [SerializeField]
    private int threshold;

    private Enemy enemy;

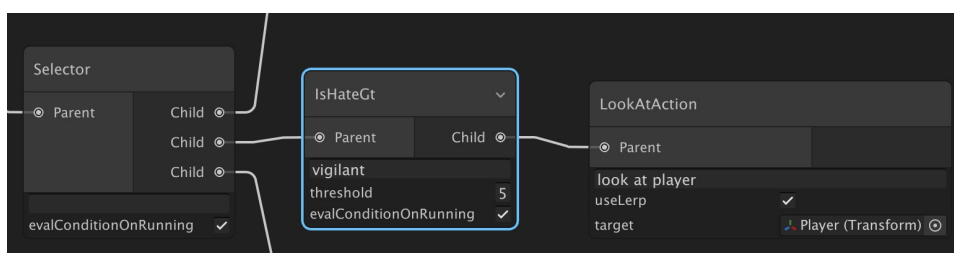
    protected override void OnAwake()
    {
        enemy = gameObject.GetComponent<Enemy>();
    }

    protected override bool IsUpdatable()
    {
        return enemy.Hate > threshold;
    }
}
```

- Conditional Node can be leaf node like Action Node.



- Conditional Node can be branch node.



Create Composite

- Create C# Script and extends `AkiBT.Composite`
- Override `OnUpdate` and return status(Success/Running/Failure).
- Override `OnAwake` called by `AkiBT.BehaviorTree.Awake` if needed.
- Override `OnStart` called by `AkiBT.BehaviorTree.Start` if needed.
- To abort the running node when the condition changed override `Abort`.
- Composite Node has `gameObject` field with `AkiBT.BehaviorTree` attached.
- Private [SerializeField] field and public field can be set on Behavior Tree editor window.

```
[AkiInfo("Composite:随机选择,等待结点结束运行后重新选择")]
[AkiLabel("Random随机选择")]
public class Random : Composite
{
    private NodeBehavior runningNode;

    protected override Status OnUpdate()
    {
        // proceed to update same node when the previous status is running
        if (runningNode != null)
        {
            return HandleStatus(runningNode.Update(), runningNode);
        }

        // update random children
        var result = UnityEngine.Random.Range(0, Children.Count);
        var target = Children[result];
        return HandleStatus(target.Update(), target);
    }

    private Status HandleStatus(Status status, NodeBehavior updated)
    {
        //save running node for next update.
        runningNode = status == Status.Running ? updated : null;
        return status;
    }

    // abort when the parent conditional changed on previous status is running.
    public override void Abort()
    {
        if (runningNode != null)
        {
            runningNode.Abort();
            runningNode = null;
        }
    }
}
```

## Create Decorator

- Decorator node is used to modify the return value and reduce the number of Conditional or Composite nodes used

- Create C# Script and extends `AkiBT.Decorator`
- Override `OnDecorate(Status childStatus)` to modify the return value according to the return value of the child node.
- Decorator inherits the `CanUpdate` of the child node, that is, if the child node is Conditional, the node will inherit its judgment value. If you want to modify `CanUpdate`, you can override `OnDecorate(bool childCanUpdate)`
- Override `OnAwake` called by `AkiBT.BehaviorTree.Awake` if needed.
- Override `OnStart` called by `AkiBT.BehaviorTree.Start` if needed.
- Composite Node has `gameObject` field with `AkiBT.BehaviorTree` attached.
- Private [SerializeField] field and public field can be set on Behavior Tree editor window.

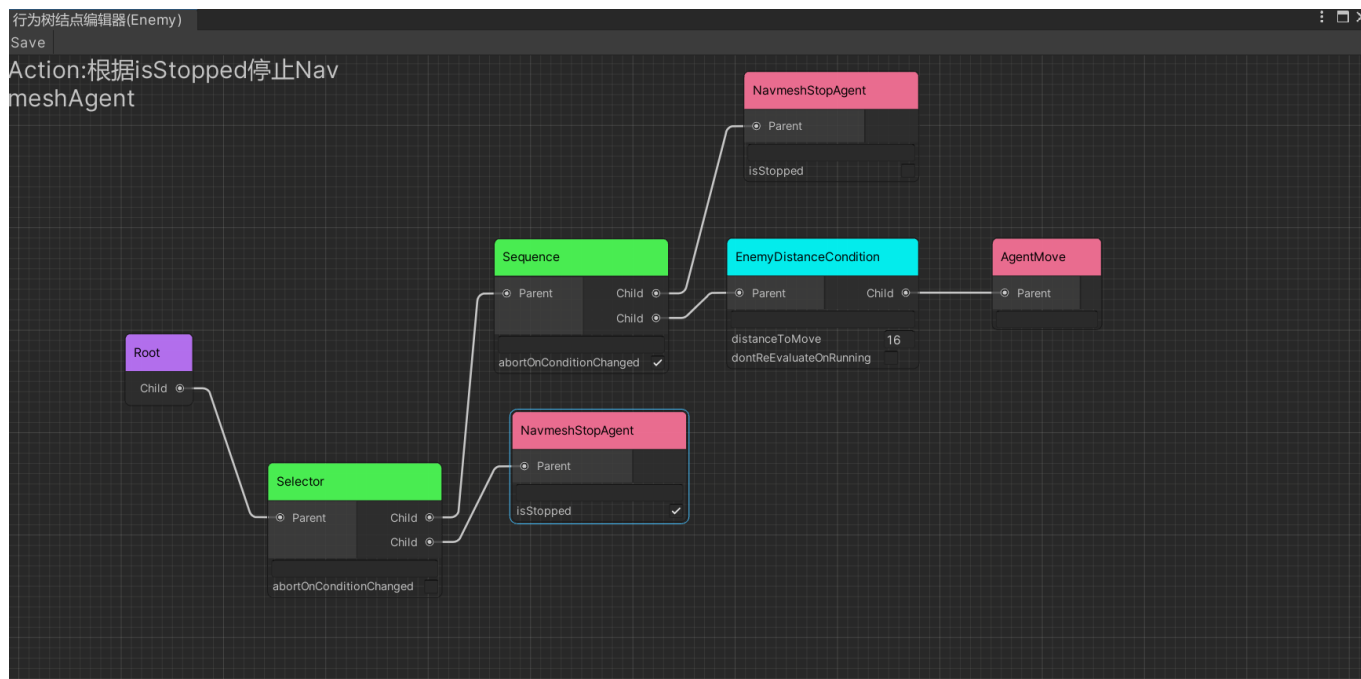
```
[AkiInfo("Decorator:子结点返回Success则反转为Failure,为Failure则反转为Successs,返回Running则保持Running")]
[AkiLabel("Invertor反转")]
public class Invertor : Decorator
{
    protected override Status OnDecorate(Status childeStatus)
    {
        if(childeStatus==Status.Success)
            return Status.Failure;
        else if(childeStatus==Status.Failure)
            return Status.Success;
        else
            return childeStatus;
    }
}
```

## 特性 Attributes

1. AkiInfo用以描述结点行为,可以显示在结点编辑器中.

You can use AkiInfo attribute to describe the behavior detail of the node for information.

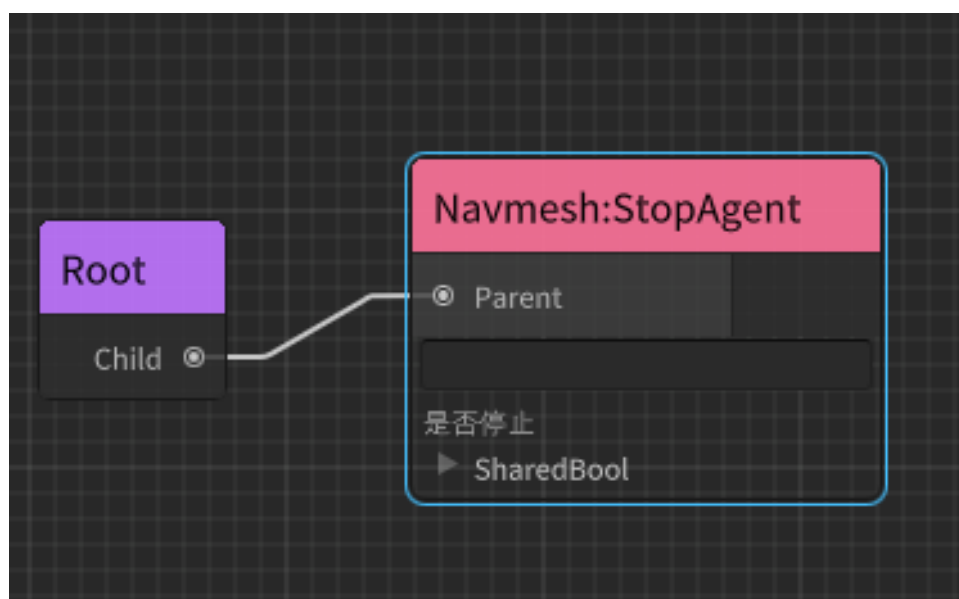
```
[AkiInfo("Action:根据isStopped停止NavmeshAgent")]
public class NavmeshStopAgent : Action
{
    private NavMeshAgent _navMeshAgent;
}
```



2. AkiLabel用以替换编辑器中的结点名称,新版本中你同样可以使用AkiLabel替换编辑器中的字段名称.

AkiLabel attribute is added for replacing label of node's title or field especially for Chinese.

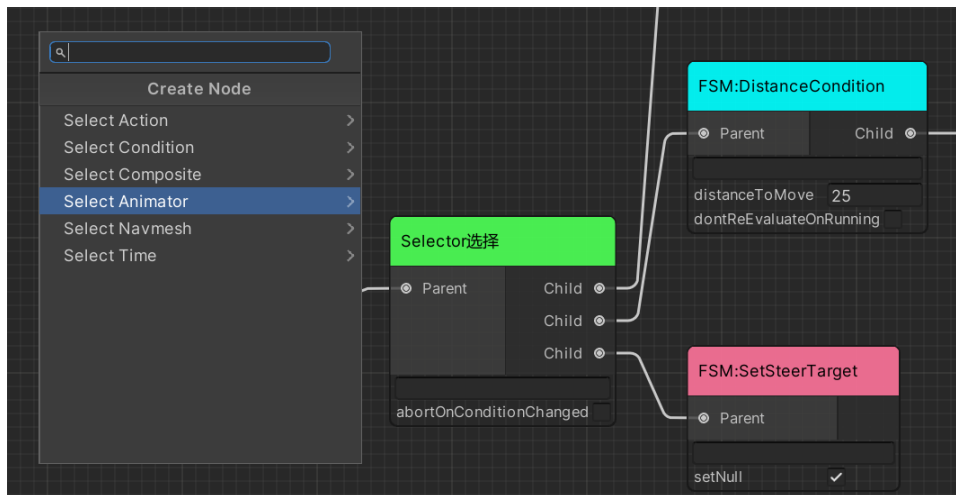
```
[AkiLabel("Navmesh:StopAgent")]
public class NavmeshStopAgent : Action
{
    private NavMeshAgent _navMeshAgent;
    [SerializeField,AkiLabel("是否停止")]
    private SharedBool isStopped;
}
```



3. AkiGroup特性用以对结点进行分类

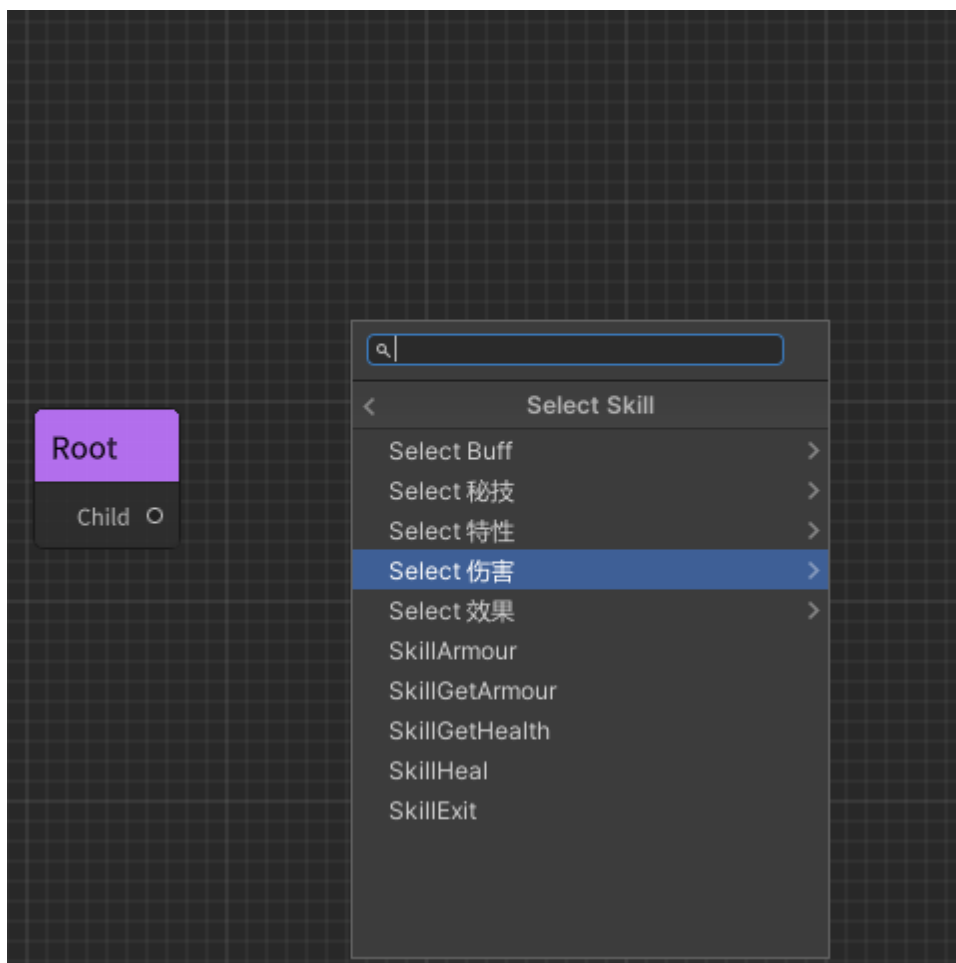
AkiGroup is an advanced attribute using in Node Searching,you can add this attribute to make it easier and more clear to find certain node.

```
[AkiGroup("Animator")]
public class AnimatorSetBool : AnimatorAction
{
}
}
```



- 你可以使用 '/' 符号进行子分类

You can also subcategory the SearchWindow by using '/'.



共享变量 SharedVariable



1. 使用共享变量需要在Awake中初始化从而绑定父级行为树中的变量。

The use of shared variables needs to be initialized in Awake to bind the variables in the parent behavior tree.

```
public class GetGameObjectPosition : Action
{
    [SerializeField]
    private SharedTObject<GameObject> target;
    [SerializeField]
    private SharedVector3 result;
    public override void Awake()
    {
        InitVariable(target);
        InitVariable(result);
    }
    protected override Status OnUpdate()
    {
        if (target.Value != null) result.Value = target.Value.transform.position;
        return Status.Success;
    }
}
```

1. 除了值类型外，你可以使用SharedObject来共享任何继承自UnityEngine.Object类型的对象。如要限制类型可以使用SharedTObject<T>这样在编辑器中的下拉栏中你将只能引用具有相同类型的SharedObject

In addition to value types, you can use SharedObject to share any object that inherits from UnityEngine.Object. If you want to limit the type you can use SharedTObject<T> so that in the drop-down bar in the editor you will only be able to reference SharedObjects with the same type

2. 在黑板中，你可以通过创建SharedObject并限制其类型来提升类型安全性并且使字段只能拖拽相应类型的对象。

In the blackboard, you can create a SharedObject and restrict its type to improve type safety and make the field only drag and drop objects of the corresponding type.

