Interaction 2: Implementation

Notes for the SIT-DP module: **Developing Immersive Applications**

Created by: Chek Tien TAN

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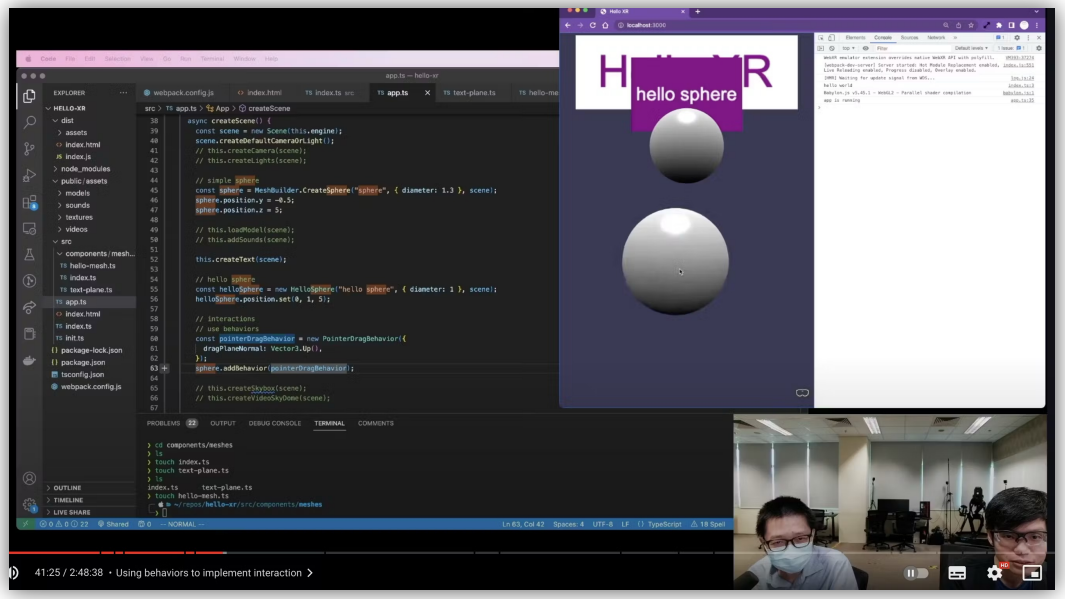
Learning Objectives

- Differentiate code constructs (behaviours, actions and observables) to implement interactions in WebXR
- Implement various typical object handling interactions in WebXR
- implement various typical locomotion interactions in WebXR

Behaviors

https://doc.babylonjs.com/features/featuresDeepDive/behaviors/

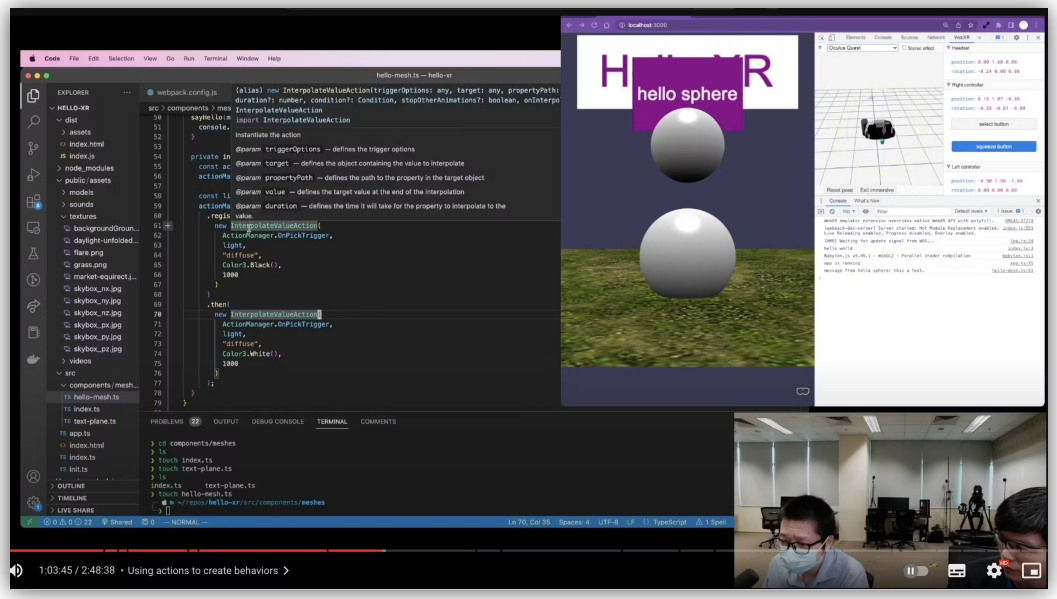
- Predefined, reusable interactions without custom code
- Common interactions like dragging, scaling, following, etc.



ActionManager

https://doc.babylonjs.com/features/featuresDeepDive/events/actions

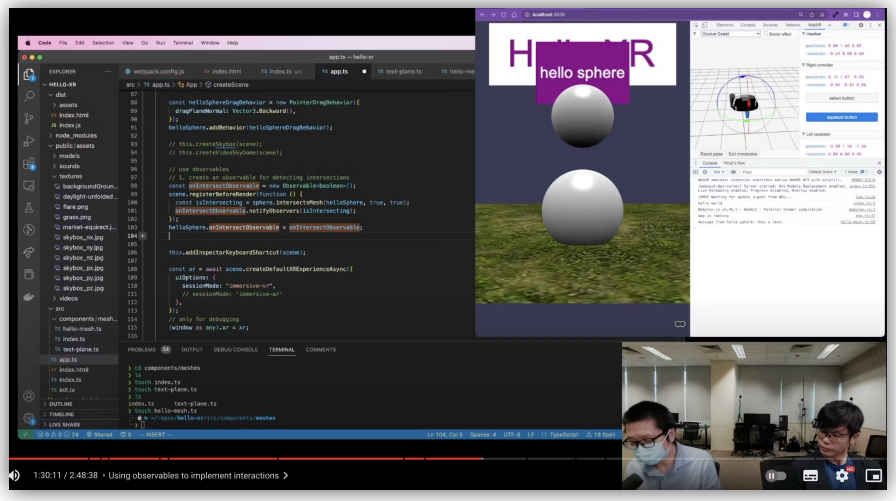
- Define property changes triggered by pre-defined events
- Customize interaction parameters (e.g., duration, conditions, triggers)



Observables

https://doc.babylonjs.com/features/featuresDeepDive/events/observables/

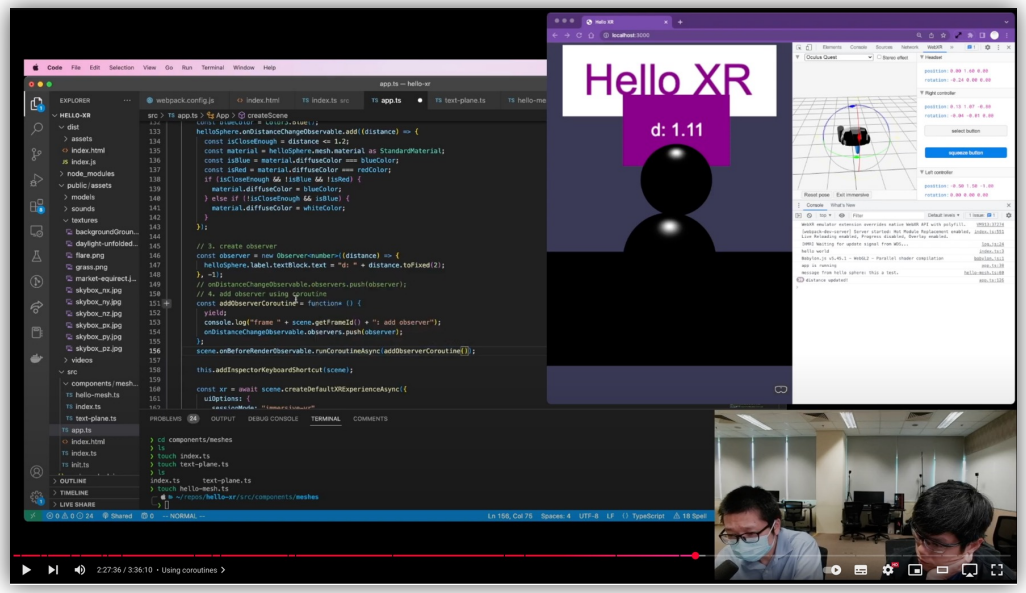
- General code construct for observer pattern
- Subscribe and receive notifications to events
- Fully customizable interactions



Coroutines

https://doc.babylonjs.com/features/featuresDeepDive/events/coroutines/

- Modern “concurrency” through generators: `function*()`
- yield to pause/resume execution per frame

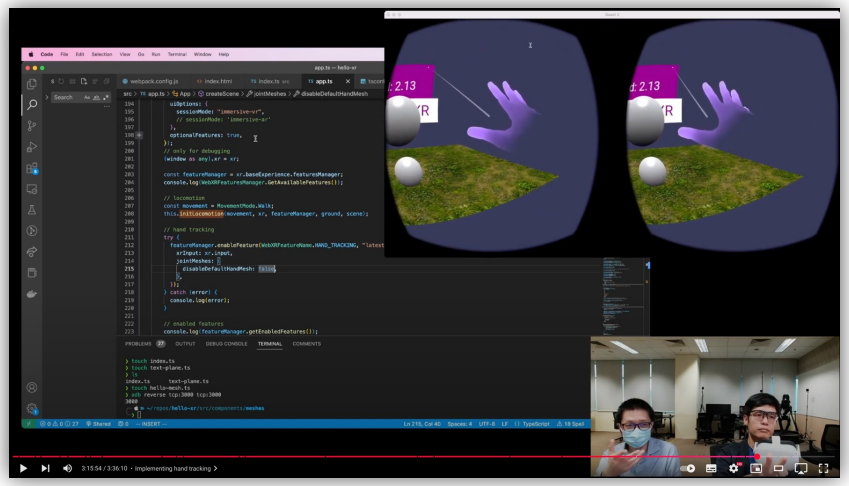


Common XR Interactions

https://doc.babylonjs.com/typedoc/classes/BABYLON.WebXRFeaturesManager

https://doc.babylonjs.com/features/featuresDeepDive/mesh/gizmo

- WebXRFeaturesManager: pre-made XR features, e.g.,
  - WebXRTeleportation
  - WebXRHandTracking, etc.
- GizmoManager: common 3D UI editing tools



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You want to create a button in your Babylon.js scene that, when touched, makes a door open with a creaking sound that lasts 0.5 seconds.

Which implementation approach is the most straightforward without reinventing the wheel?

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You want to create a button in your Babylon.js scene that, when touched, makes a door open with a creaking sound that lasts 0.5 seconds.

Which implementation approach is the most straightforward without reinventing the wheel?

- Behaviors

  0%

- ActionManager

  0%

- Observables

  0%

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Implement a jump action in your Babylon.js scene when the user presses the keyboard spacebar. Which trigger should you use in the ActionManager?

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Implement a jump action in your Babylon.js scene when the user presses the keyboard spacebar. Which trigger should you use in the ActionManager?

- OnPickTrigger

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- OnIntersectionEnterTrigger

  0%

- OnKeyUpTrigger

  0%

- NothingTrigger

  0%

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In your Babylon.js scene, you need to periodically track changes in the position of a dog object and automatically show updates on the HUD based on its proximity to different objects.

Which implementation approach is the most straightforward without reinventing the wheel?

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In your Babylon.js scene, you need to periodically track changes in the position of a dog object and automatically show updates on the HUD based on it's proximity to different objects.

Which implementation approach is the most straightforward without reinventing the wheel?

- Behaviors

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- ActionManager

  0%

- Observables

  0%

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In your Babylon.js scene, when a pen mesh and a paper mesh touch each other (i.e., intersect), you want to show virtual ink appearing.

Which implementation approach is the most straightforward without reinventing the wheel?

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In your Babylon.js scene, when a pen mesh and a paper mesh touch each other (i.e., intersect), you want to show virtual ink appearing.

Which implementation approach is the most straightforward without reinventing the wheel?

- Behaviors

  0%

- ActionManager

  0%

- Observables

  0%

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In total, how many observers were used here?

```
const onDistanceChangeObservable = new Observable<number>();

let previousDistance: number;
scene.onBeforeRenderObservable.add(() => {
    const currentDistance = Vector3.Distance( sphere.position, Vector3.Zero());

    if (currentDistance !== previousDistance) {
        previousDistance = currentDistance;
        onDistanceChangeObservable.notifyObservers(currentDistance);
    }
});

onDistanceChangeObservable.add(distance => {
    helloText.text = `d: ${distance.toFixed(2)}`;
});
```

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In total, how many observers were used here?

Show Image | Show poll options

0 — 0%

1 — 0%

2 — 0%

3 — 0%

4 — 0%

5 — 0%

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In total, how many observables did we operate on?

```
const onDistanceChangeObservable = new Observable<number>();

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scene.onBeforeRenderObservable.add(() => {
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Show Image | Show poll options

0 — 0%

1 — 0%

2 — 0%

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4 — 0%

5 — 0%

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In total, how many observables did we create?

```
const onDistanceChangeObservable = new Observable<number>();

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```

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In total, how many observables did we create?

- 0 — 0%
- 1 — 0%
- 2 — 0%
- 3 — 0%
- 4 — 0%
- 5 — 0%

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What is the mechanics of the following code?

```
pointerDragBehavior.onDragObservable.add(eventData => {
    console.log(sphere.position);
});
```

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What is the mechanics of the following code?

- It adds an Observable to pointerDragBehavior of the sphere

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- It adds an Observer to the sphere

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- It adds an Observer to the onDragObservable of the pointerDragBehavior

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- It adds an Observable to the sphere

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What is the order of the console logs in the following Babylon.js code?
(Assume the rest of the code is correct and the scene is set up properly)

```
const outOfOrder = function* () {
    (async function () {
        await Tools.DelayAsync(3000);
        console.log('1');
    })();
    yield;
    (async function () {
        console.log('2');
    })();
    yield;
    (async function () {
        await Tools.DelayAsync(1000);
        console.log('3');
    })();
    yield;
    (async function () {
        await Tools.DelayAsync(2000);
        console.log('4');
    })();
};
scene.onBeforeRenderObservable.runCoroutineAsync(outOfOrder());
```

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What is the order of the console logs in the following Babylon.js code?
(Assume the rest of the code is correct and the scene is set up properly)

- 1, 2, 3, 4 — 0%
- 2, 3, 4, 1 — 0%
- 1, 4, 3, 2 — 0%
- 4, 3, 2, 1 — 0%

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Which API class in Babylon.js will allow you to easily add UI controls to easily manipulate the position, rotation, and scale of meshes in your scene?

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Which API class in Babylon.js will allow you to easily add UI controls to easily manipulate the position, rotation, and scale of meshes in your scene?

- MultiPointerScaleBehavior

  0%

- GizmoManager

  0%

- PointerDragBehavior

  0%

- WebXRFeaturesManager

  0%

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What does timeToTeleport do in the following Babylon.js code?

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What does timeToTeleport do in the following Babylon.js code?

- sets the duration of the teleportation animation

  0%

- sets the maximum time to complete the teleportation

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- sets the minimum delay between each teleportation trigger

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- sets the time in to hold the button before teleportation triggers

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Audience Q&A

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