Git Initiate

(if unity project doesn't exist)

Start Unity 3D project, FirstPersonMovement
Save and exit the Project
Rename project folder to FirstPersonMovementx
Create Repo named FirstPersonMovementin Git
git clone https://github.com/rayhere/FirstPersonMovement.git
cd FirstPersonMovement
Drag the project files from FirstPersonMovementx into FirstPersonMovementfolder
git add .
git commit -a -m "2nd commit, project initiated"
git push

FIRST PERSON MOVEMENT in 10 MINUTES - Unity Tutorial

https://www.youtube.com/watch?v=f473C43s8nE

Summary

This will create a Player in ThirdPerson View
With Move and Jump
With Character Controller
No Animation
No Rigidbody

Step1 Setup a camera

Required Package
Input System
Cinemachine
ProBuilder

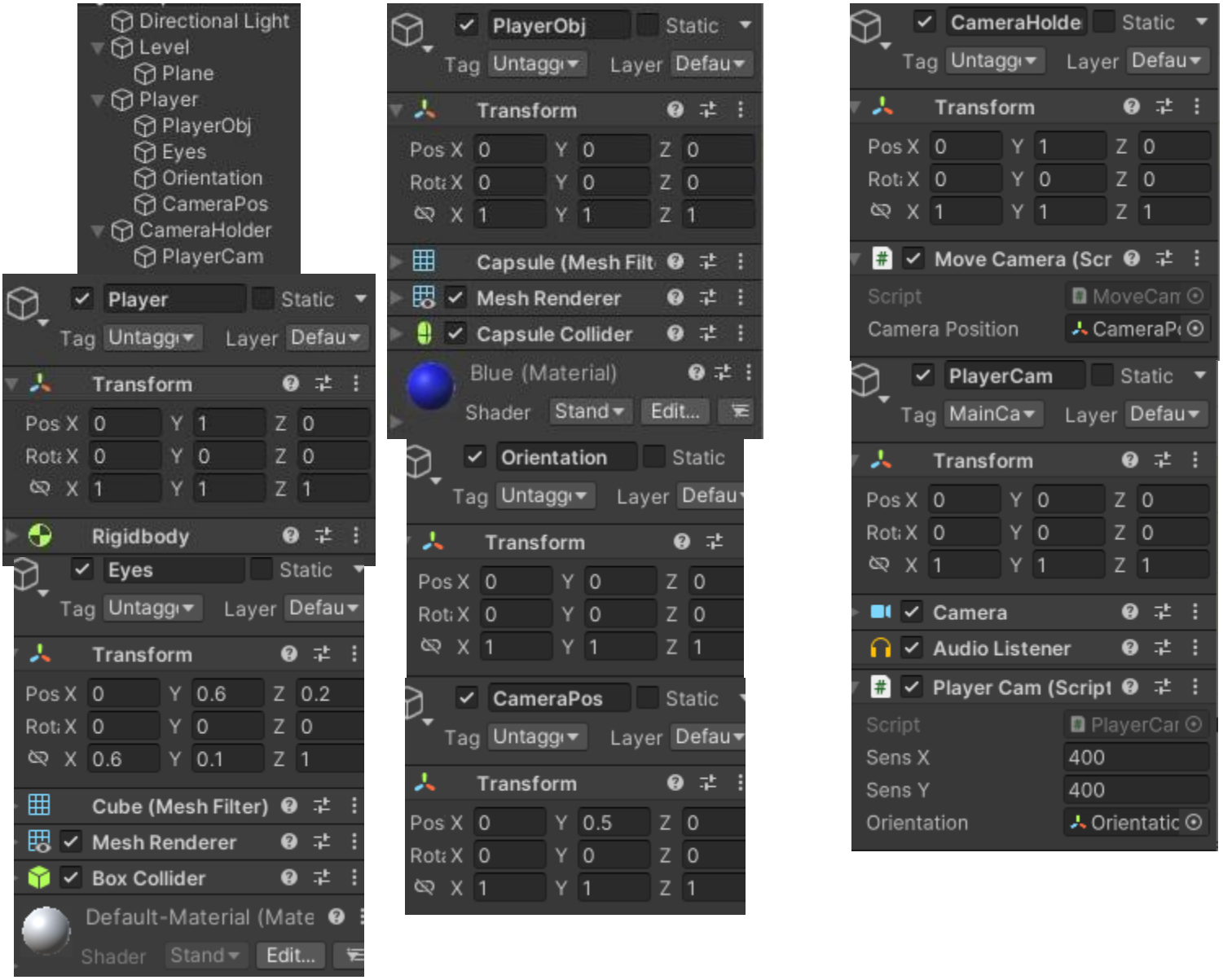
https://youtu.be/f473C43s8nE?si=0GgS2H4KKc4HfyiT&t=131
Create

- ☐ Create Empty named Level >
  - ☐ Create 3DObject > Plane > apply Material named Ground
- ☐ Empty named Player > Pos.y 1 > add Rigidbody > Interpolate Interpolate [Rigidbody] > CollisionDetection Continuous

- [ ] 3DObject > Capsule named PlayerObj > add PlayerInput > Create Actions [PlayerInput] named PlayerInputAction > apply PlayerInputAction in Action [PlayerInput]
    - [ ] 3DObject > Cube named Eyes > Pos 0, 0.6, 0.2 > Scale 0.6, 0.1, 1
- [ ] Create Empty Object named Orientation

- [ ] Create Empty named CameraHolder > add MoveCamera.cs > Transform same as Player [GameObject] > Drag CameraPos child of Player [GameObject] to CameraPosition [MoveCamera.cs]
    - [ ] Drag MainCamera here, named PlayerCam > Pos 0,0,0 > add PlayerCam.cs > set value 400 for SensX, SensY > Drag Orientation child of Player [GameObject] to Orientation [PlayerCam.cs]

P.S. You can directly adjust PlayerCam Pos to have better view



Change:

Empty Object named Orientation is for keeps track of the direction you're facing
Orientation [EmptyObject] stores the direction your facing

Put the camera into a separate camera holder
https://youtu.be/f473C43s8nE?si=KI9Zczq1Wht0kLeX&t=154
Because having a camera on a rigidbody object can be a bit buggy

In order for this to work, you just need this CameraPos [EmptyObject] inside the player.
Drag it up a bit, CameraPos Pos.Y is about Player [GameObject] Pos.Y

Then on the camera holder, you can add this really simple script MoveCamera.cs, to make the camera always move with your player

Create 2 script
MoveCamera.cs
PlayerCam.cs

Code

MoveCamera.cs

```
using System.Collections;
using System.Collections.Generic;
using UnityEngine;

public class MoveCamera : MonoBehaviour
{
    public Transform cameraPosition;

    private void Update()
    {
        transform.position = cameraPosition.position;
    }
}
```

PlayerCam.cs

```
using System.Collections;
using System.Collections.Generic;
using UnityEditor.Experimental.GraphView;
using UnityEngine;

public class PlayerCam : MonoBehaviour
{
    public float sensX; // Sensitivity for mouse X axis
    public float sensY; // Sensitivity for mouse Y axis

    public Transform orientation; // Reference to the player's orientation
transform

    float xRotation; // Current rotation around the X axis
    float yRotation; // Current rotation around the Y axis

    private void Start()
    {
        // Lock the cursor in the middle of the screen and make it
invisible
        Cursor.lockState = CursorLockMode.Locked;
        Cursor.visible = false;
    }

    private void Update()
    {
        // Get mouse input
        float mouseX = Input.GetAxisRaw("Mouse X") * Time.deltaTime *
sensX;
        float mouseY = Input.GetAxisRaw("Mouse Y") * Time.deltaTime *
sensY;

        // Update rotation values based on mouse input
        yRotation += mouseX;
        xRotation -= mouseY;

        // Clamp the rotation around the X axis to prevent looking up or
down more than 90 degrees
        xRotation = Mathf.Clamp(xRotation, -90f, 90f);
```

```
        // Rotate the camera and player orientation along both the X and Y
axes
        transform.rotation = Quaternion.Euler(xRotation, yRotation, 0);

        // Rotate the player's orientation along the Y axis
        orientation.rotation = Quaternion.Euler(0, yRotation, 0);
    }
}
```

FIRST PERSON MOVEMENT in 10 MINUTES - Unity Tutorial

https://youtu.be/f473C43s8nE?si=YFn1_gT9Xg2Zde3q&t=200

Step2 Set up a movement

Create PlayerMovement.cs > add PlayerMovement.cs in Player [GameObject] >

Drag Orientation Player[GameObject] into Orientation PlayerMovement.cs Player[GameObject] >

Create Layer named Ground > pick Ground Layer in WhatIsGround PlayerMovement.cs[GameObject]

Drag & Speed Control

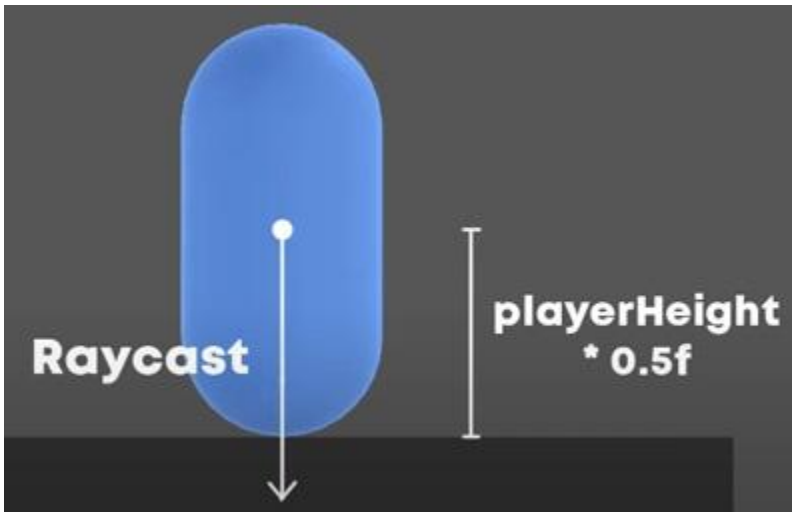
https://youtu.be/f473C43s8nE?si=Ww2eetEaE8hYKGk8&t=305

Apply drag to the player's ridgebody, which will make the movement less slippery and to limit the player's velocity to its movement speed

Apply Drag when Player on Ground

Ground Check

To perform the ground check, you want to shoot the raycast from your current position down, and see if it hits something, the length of this ray will be half of your player's height + a bit more.




```
    [Header("Movement")]
    public float groundDrag;
    [Header("Ground Check")]
    public float playerHeight;
    public LayerMask whatIsGround;
    bool grounded;

    private void Update()
    {
        GroundDrag();
    }

    private void GroundDrag()
    {
        // Perform ground check
        grounded = Physics.Raycast(transform.position, Vector3.down,
playerHeight * 0.5f + 0.3f, whatIsGround);

        // Apply drag when grounded
        rb.drag = grounded ? groundDrag : 0;
    }
```

Jumping & Air Control

https://youtu.be/f473C43s8nE?si=pxDbN1yNIVLISXS5&t=442

```
    public float jumpForce;
    public float jumpCooldown;
    public float airMultiplier;
    bool readyToJump;
```

```
private void MyInput()
    {
        // Check for jump input and conditions for jumping
        if (Input.GetKey(jumpKey) && readyToJump && grounded)
        {
            readyToJump = false;
            Debug.Log("Jump!");
            Jump();
            Invoke(nameof(ResetJump), jumpCooldown); // Allow to
continuously jump if the jump key is held down
        }
    }
```

```
private void Jump()
    {
        // Reset vertical velocity before applying jump force to avoid
accumulating jump force
        rb.velocity = new Vector3(rb.velocity.x, 0f, rb.velocity.z);

        // Apply impulse force for jumping
        rb.AddForce(transform.up * jumpForce, ForceMode.Impulse);
    }

    private void ResetJump()
    {
        readyToJump = true;
    }
```

Code

PlayerMovement.cs

```
using System.Collections;
using System.Collections.Generic;
using UnityEngine;
using TMPro;

public class PlayerMovement : MonoBehaviour
{
    [Header("Movement")]
    public float moveSpeed;

    public float groundDrag;

    public float jumpForce;
    public float jumpCooldown;
    public float airMultiplier;
    bool readyToJump;

    [HideInInspector] public float walkSpeed;
    [HideInInspector] public float sprintSpeed;

    [Header("Keybinds")]
    public KeyCode jumpKey = KeyCode.Space;

    [Header("Ground Check")]
    public float playerHeight;
    public LayerMask whatIsGround;
    bool grounded;

    public Transform orientation;

    // To hold your input
    float horizontalInput;
    float verticalInput;

    Vector3 moveDirection;
```

```
    Rigidbody rb;

    private void Start()
    {
        // Assign your Rigidbody and freeze its rotation
        rb = GetComponent<Rigidbody>();
        rb.freezeRotation = true;

        readyToJump = true;
    }

    private void Update()
    {
        GroundDrag();
        MyInput(); // This will keep checking allowed input for all
movement
        SpeedControl();
    }

    private void FixedUpdate()
    {
        MovePlayer(); // To apply force on the player Rigidbody
    }

    // This method will handle your input, including movement and jumping,
and verify if jumping is allowed
    private void MyInput()
    {
        horizontalInput = Input.GetAxisRaw("Horizontal");
        verticalInput = Input.GetAxisRaw("Vertical");

        // Check for jump input and conditions for jumping
        if (Input.GetKey(jumpKey) && readyToJump && grounded)
        {
            readyToJump = false;

            Jump();

            Invoke(nameof(ResetJump), jumpCooldown); // Allow to
continuously jump if the jump key is held down
```

```
        }
    }

    private void MovePlayer()
    {
        // Calculate movement direction based on orientation
        moveDirection = orientation.forward * verticalInput +
orientation.right * horizontalInput;

        // Apply force for movement based on ground or air
        if (grounded)
            rb.AddForce(moveDirection.normalized * moveSpeed * 10f,
ForceMode.Force);
        else if (!grounded)
            rb.AddForce(moveDirection.normalized * moveSpeed * 10f *
airMultiplier, ForceMode.Force);
    }

    private void SpeedControl()
    {
        // Get the horizontal velocity
        Vector3 flatVel = new Vector3(rb.velocity.x, 0f, rb.velocity.z);

        // Limit velocity if needed to prevent exceeding maximum speed
        if (flatVel.magnitude > moveSpeed)
        {
            Vector3 limitedVel = flatVel.normalized * moveSpeed;
            rb.velocity = new Vector3(limitedVel.x, rb.velocity.y,
limitedVel.z);
        }
    }

    private void Jump()
    {
        // Reset vertical velocity before applying jump force to avoid
accumulating jump force
        rb.velocity = new Vector3(rb.velocity.x, 0f, rb.velocity.z);

        // Apply impulse force for jumping
        rb.AddForce(transform.up * jumpForce, ForceMode.Impulse);
```

```
    }

    private void ResetJump()
    {
        readyToJump = true;
    }

    private void GroundDrag()
    {
        // Perform ground check
        grounded = Physics.Raycast(transform.position, Vector3.down,
playerHeight * 0.5f + 0.3f, whatIsGround);

        // Apply drag when grounded
        rb.drag = grounded ? groundDrag : 0;
    }
}
```

Problem: Rigidbody won’t do rotation follow the direction of PlayerCam

To Fix:
First, create a serialized field for the PlayerCam object:

```
[SerializeField] private Transform playerCam;
```

Then, in your `Update()` or `FixedUpdate()` method, update the rotation of the Rigidbody to match the rotation of the PlayerCam object:

```
private void Update()
    {
        GroundDrag();
        MyInput(); // This will keep checking allowed input for all
movement
        SpeedControl();
        RotatePlayer();
    }
private void RotatePlayer()
    {
        if (playerCam != null)
        {
            // Set the Rigidbody's rotation to match the PlayerCam's
rotation
            rb.rotation = Quaternion.Euler(0f, playerCam.eulerAngles.y,
0f);
        }
    }
```

Code

PlayerMovement.cs Fix update rb rotation follow the roataion of separate object

```
using System.Collections;
using System.Collections.Generic;
using UnityEngine;
using TMPro;

public class PlayerMovement : MonoBehaviour
{
    [Header("Movement")]
    public float moveSpeed;

    public float groundDrag;

    public float jumpForce;
    public float jumpCooldown;
    public float airMultiplier;
    bool readyToJump;

    [HideInInspector] public float walkSpeed;
    [HideInInspector] public float sprintSpeed;

    [Header("Keybinds")]
    public KeyCode jumpKey = KeyCode.Space;

    [Header("Ground Check")]
    public float playerHeight;
    public LayerMask whatIsGround;
    bool grounded;

    public Transform orientation;

    [SerializeField] private Transform playerCam;

    // To hold your input
    float horizontalInput;
    float verticalInput;
```

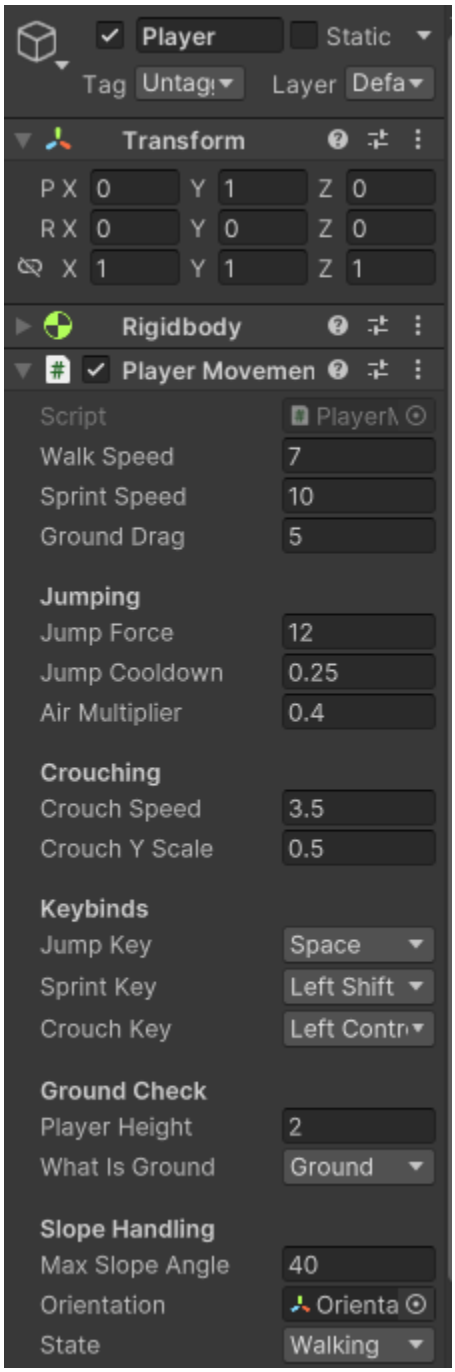
```
    Vector3 moveDirection;

    Rigidbody rb;

    private void Start()
    {
        // Assign your Rigidbody and freeze its rotation
        rb = GetComponent<Rigidbody>();
        rb.freezeRotation = true;

        readyToJump = true;
    }

    private void Update()
    {
        GroundDrag();
        MyInput(); // This will keep checking allowed input for all
movement
        SpeedControl();
        RotatePlayer();
    }

    private void FixedUpdate()
    {
        MovePlayer(); // To apply force on the player Rigidbody
    }

    // This method will handle your input, including movement and jumping,
and verify if jumping is allowed
    private void MyInput()
    {
        horizontalInput = Input.GetAxisRaw("Horizontal");
        verticalInput = Input.GetAxisRaw("Vertical");

        // Check for jump input and conditions for jumping
        if (Input.GetKey(jumpKey) && readyToJump && grounded)
        {
            readyToJump = false;
            Debug.Log("Jump!");
```

```
            Jump();

            Invoke(nameof(ResetJump), jumpCooldown); // Allow to
continuously jump if the jump key is held down
        }
    }

    private void MovePlayer()
    {
        // Calculate movement direction based on orientation
        moveDirection = orientation.forward * verticalInput +
orientation.right * horizontalInput;

        // Apply force for movement based on ground or air
        if (grounded)
            rb.AddForce(moveDirection.normalized * moveSpeed * 10f,
ForceMode.Force);
        else if (!grounded)
            rb.AddForce(moveDirection.normalized * moveSpeed * 10f *
airMultiplier, ForceMode.Force);
    }

    private void SpeedControl()
    {
        // Get the horizontal velocity
        Vector3 flatVel = new Vector3(rb.velocity.x, 0f, rb.velocity.z);

        // Limit velocity if needed to prevent exceeding maximum speed
        if (flatVel.magnitude > moveSpeed)
        {
            Vector3 limitedVel = flatVel.normalized * moveSpeed;
            rb.velocity = new Vector3(limitedVel.x, rb.velocity.y,
limitedVel.z);
        }
    }

    private void Jump()
    {
        // Reset vertical velocity before applying jump force to avoid
accumulating jump force
```

```
        rb.velocity = new Vector3(rb.velocity.x, 0f, rb.velocity.z);

        // Apply impulse force for jumping
        rb.AddForce(transform.up * jumpForce, ForceMode.Impulse);
    }

    private void ResetJump()
    {
        readyToJump = true;
    }

    private void GroundDrag()
    {
        // Perform ground check
        grounded = Physics.Raycast(transform.position, Vector3.down,
playerHeight * 0.5f + 0.3f, whatIsGround);

        // Apply drag when grounded
        rb.drag = grounded ? groundDrag : 0;
    }

    private void RotatePlayer()
    {
        if (playerCam != null)
        {
            // Set the Rigidbody's rotation to match the PlayerCam's
rotation
            rb.rotation = Quaternion.Euler(0f, playerCam.eulerAngles.y,
0f);
        }
    }
}
```

SLOPE MOVEMENT, SPRINTING & CROUCHING - Unity Tutorial

https://www.youtube.com/watch?v=xCxSjgYTw9c



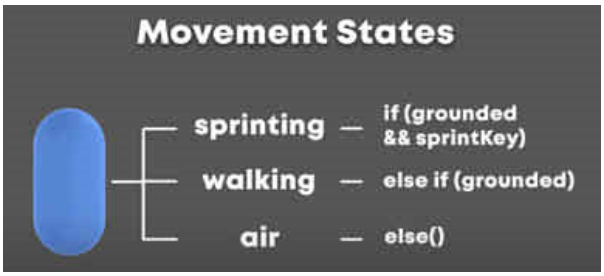
Summary

Have different movement states include:
Walking, Sprinting, Jumping, Crouching
Have basic On slope movement
Cons:
Crouching is rescale function, just squeeze the transform Scale
On slope movement will turn off rb.gravity while rb on Slope, however jump movespeed have no different between onslope or off slope, because it always apply air movement speed for jump
Missing
Cam rotation apply on Rig rotation still missing
Animation didn't apply on move
Cinemachine missing

PlayerMovementAdvanced.cs in Player [GameObject]

To code the sprinting ability
https://youtu.be/xCxSjgYTw9c?si=7IqvPFZ6LCN2tr71&t=53

To Create movement states for our player, depending on which keys you're pressing.
the player will enter a different state



Sprinting

```
    [Header("Keybinds")]
    public KeyCode jumpKey = KeyCode.Space;
    public KeyCode sprintKey = KeyCode.LeftShift;
    public KeyCode crouchKey = KeyCode.LeftControl;
```

```
    public MovementState state; // To store the current state of the
player
    public enum MovementState
    {
        walking,
        sprinting,
        crouching,
        air
    }
```

To set your movement state to different state depend on input

```
StateHandler()
```

```
private void StateHandler()  // Change MovementState and value depend on
input
    {
        // Mode - Crouching
        if (Input.GetKey(crouchKey))  // If crouchKey down
        {
            state = MovementState.crouching; // Change crouch State
            moveSpeed = crouchSpeed;  // Set the speed
        }

        // Mode - Sprinting
        else if(grounded && Input.GetKey(sprintKey)) // Do Sprinting here
        {
            state = MovementState.sprinting;
            moveSpeed = sprintSpeed;
        }

        // Mode - Walking
        else if (grounded)
        {
            state = MovementState.walking; // Stop Sprint
```

```
            moveSpeed = walkSpeed;
        }

        // Mode - Air
        else
        {
            state = MovementState.air;
        }
    }
```

Last,

```
private void Update()
    {
        MyInput();
        SpeedControl();
        StateHandler(); // always update statehandler, tracking the input
    }
```

https://youtu.be/xCxSjgYTw9c?si=GHeNVmfZOknt7564&t=118

Crouching

```
    [Header("Crouching")]
    public float crouchSpeed;
    public float crouchYScale;
    private float startYScale; // to store the original yScale
```

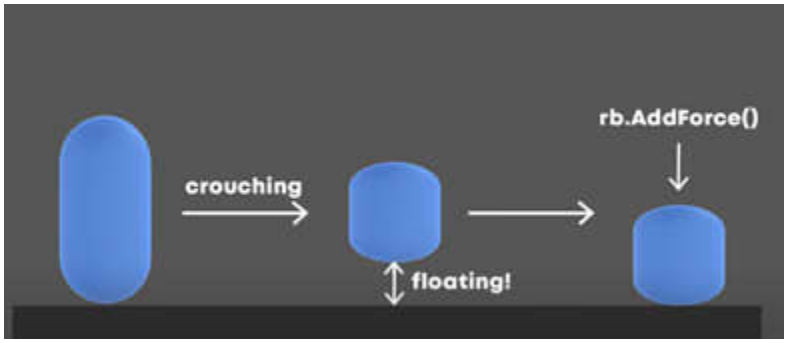
```
private void Start()
    {
        rb = GetComponent<Rigidbody>();
        rb.freezeRotation = true;

        readyToJump = true;

        startYScale = transform.localScale.y;
    }
```

Check crouchKey input, invoke Crouch Scale

```
    private void MyInput()
```

```
    {
        // start crouch
        if (Input.GetKeyDown(crouchKey)) // check if put down crouchKey
        {  // To shrink your player down by setting your local scale to a new vector3, keep the x and z scale the same, but change the y scale to your crouch y scale
            transform.localScale = new Vector3(transform.localScale.x, crouchYScale, transform.localScale.z);
            rb.AddForce(Vector3.down * 5f, ForceMode.Impulse); // push rb down
        }

        // stop crouch
        if (Input.GetKeyUp(crouchKey))
        {
            transform.localScale = new Vector3(transform.localScale.x, startYScale, transform.localScale.z);
        }
    }
```

There have problem if changed player scale down, it will floating in the air, so need to add downward force to quickly push the player on the ground



https://youtu.be/xCxSjgYTw9c?si=zRWvpuZw-Bf5LopL&t=162

Change the state with StateHandler according Input

```
    private void StateHandler()
    {
        // Mode - Crouching
        if (Input.GetKey(crouchKey)) // if key pressed
        {
            state = MovementState.crouching; // Change the state
            moveSpeed = crouchSpeed; // change the speed, reduced
        }
```

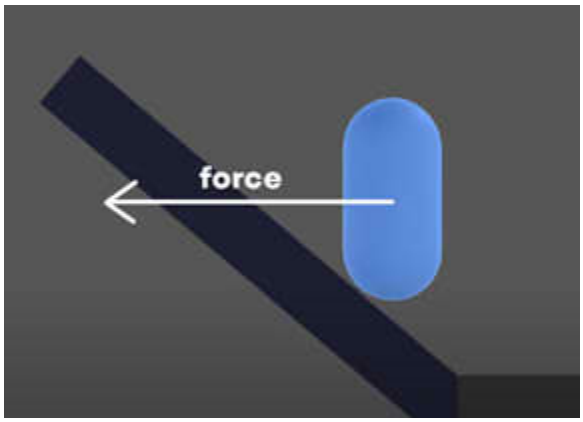
```
        // Mode - Sprinting
        else if(grounded && Input.GetKey(sprintKey))
    }
```

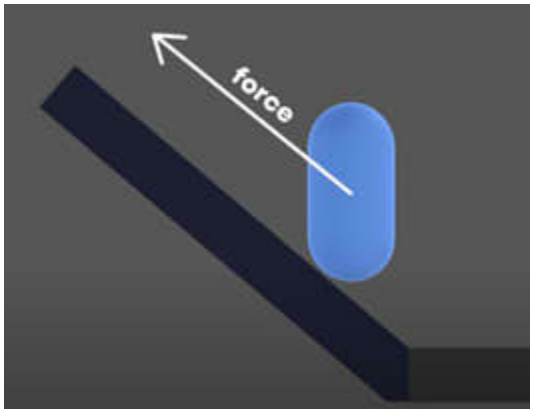
https://youtu.be/xCxSjgYTw9c?si=uezzoPqO5iqKj4K2&t=214

Slope Movement

https://youtu.be/xCxSjgYTw9c?si=8Tn5m0T5gBZo9kSa&t=225

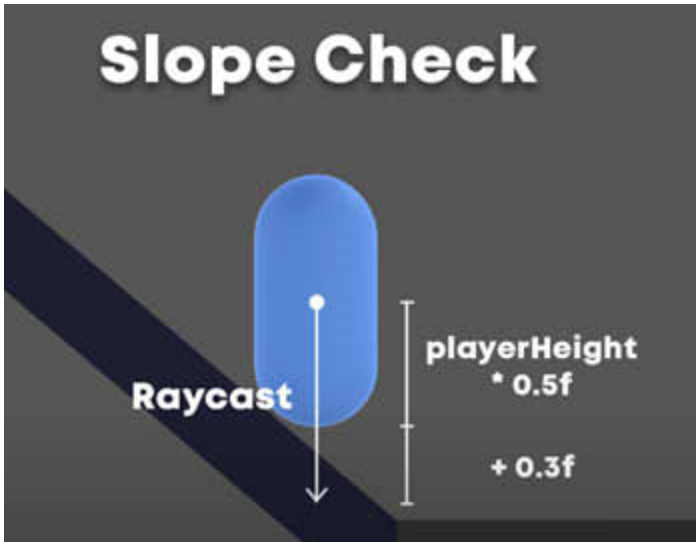
To get better slope movement
Don't adding force directly into the slope
Apply force relative to the angle of the slope





First, check if the player is even standing on the slope

```
    [Header("Slope Handling")]
    public float maxSlopeAngle;
    private RaycastHit slopeHit;
    private bool exitingSlope;
```



Shoot raycast downwards, and the length will be half of our player's height + a bit more (like the ground check)

To find the correct direction relative to our slope

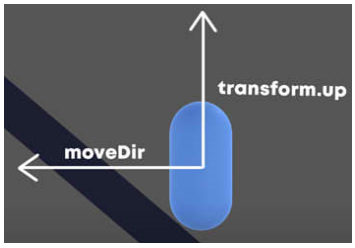
```
    private bool OnSlope()
    {
        if(Physics.Raycast(transform.position, Vector3.down, out slopeHit,
playerHeight * 0.5f + 0.3f))
        {
// Calculate the angle between the player's direction and the surface
normal
            float angle = Vector3.Angle(Vector3.up, slopeHit.normal);
            // Determine if the angle is within the acceptable slope range
            return angle < maxSlopeAngle && angle != 0;
        }
        return false;
    }//
// slopeHit stores the information of the object we hit in the slope hit
variable
// with Vector3.Angle we can calculate how steep the slope per standard is
// and we want the bool to return true if the angle is smaller than our
max slope angle and not zero.
// if the raycast doesn't hit anything, the bool should return false
```

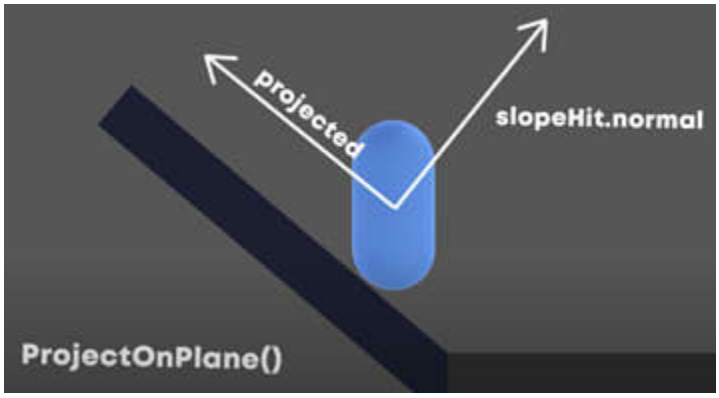
Find the correct direction relative to our slope

```
private Vector3 GetSlopeMoveDirection()
    {
```

```
        return Vector3.ProjectOnPlane(moveDirection,
slopeHit.normal).normalized;
    }
// use the project on plane function passing in your move direction and
the slopeHit.normal
```

Now
We projected our normal move direction onto the slope






```
private void MovePlayer()
    {
        // calculate movement direction
        moveDirection = orientation.forward * verticalInput +
orientation.right * horizontalInput;
        // on slope
        if (OnSlope() && !exitingSlope)
        {
            rb.AddForce(GetSlopeMoveDirection() * moveSpeed * 20f,
ForceMode.Force); // it will put extra force when rb on slope

            if (rb.velocity.y > 0)
                rb.AddForce(Vector3.down * 80f, ForceMode.Force);
        }
        // on ground
        else if(grounded)

    }
```

https://youtu.be/xCxSjgYTw9c?si=tmD_UQGpb2DUGRs3&t=355

Now, when rb is on slope, it will slide down the slope because of gravity

https://youtu.be/xCxSjgYTw9c?si=Lqp9hj9jFaXS3M89&t=360
Turn off the rb's gravity while we're standing on a slope. (not a good way)

```
 private void MovePlayer()
    {
        // turn gravity off while on slope
        rb.useGravity = !OnSlope();
    }
```

Weird bumping movement if gravity off on slope while moving up on slope
https://youtu.be/xCxSjgYTw9c?si=LRjHaYxcZqUzKUwb&t=391

```
    private void MovePlayer()
    {
        // calculate movement direction
        moveDirection = orientation.forward * verticalInput +
orientation.right * horizontalInput;

        // on slope
        if (OnSlope() && !exitingSlope)
        {
            rb.AddForce(GetSlopeMoveDirection() * moveSpeed * 20f,
ForceMode.Force);

            if (rb.velocity.y > 0)
                rb.AddForce(Vector3.down * 80f, ForceMode.Force);
        }
```

Moving too fast on slope
https://youtu.be/xCxSjgYTw9c?si=7H5PG_T8ksDRDOy-&t=414

Because of SpeedControl()
Limit the player's velocity to our move speed, while player is on slope and not exist, even it is jumping on slope, no matter in which direction the player is going

```
    private void SpeedControl()
    {
        // limiting speed on slope
        if (OnSlope() && !exitingSlope)
        {
            if (rb.velocity.magnitude > moveSpeed)
                rb.velocity = rb.velocity.normalized * moveSpeed;
        }
```

Can’t jump
https://youtu.be/xCxSjgYTw9c?si=nGVZVjt8-7FTU74d&t=459

```
    [Header("Slope Handling")]
    public float maxSlopeAngle;
    private RaycastHit slopeHit;
    private bool exitingSlope; // add this line
```

```
    private void Jump()
    {
        exitingSlope = true; // if you are jumping, set it to true
        // reset y velocity
        rb.velocity = new Vector3(rb.velocity.x, 0f, rb.velocity.z);
        rb.AddForce(transform.up * jumpForce, ForceMode.Impulse);
    }
```

```
    private void ResetJump() // for continuous jump
    {
        readyToJump = true;
        exitingSlope = false; // set it to false to reset your jump
    }
```

Only apply the limitation and slope movement if you’re not trying to exit the slope

```
    private void SpeedControl()
    {
        // limiting speed on slope
        if (OnSlope() && !exitingSlope) // Here, now won’t do speed limit
while jumping on slope
        {
            if (rb.velocity.magnitude > moveSpeed)
                rb.velocity = rb.velocity.normalized * moveSpeed;
        }
```

```
    private void MovePlayer()
    {
        // calculate movement direction
        moveDirection = orientation.forward * verticalInput +
orientation.right * horizontalInput;
```

```
        // on slope
        if (OnSlope() && !exitingSlope) // Here
        {
            rb.AddForce(GetSlopeMoveDirection() * moveSpeed * 20f,
ForceMode.Force);

            // since we turn off the gravity on slope
            // if the player is moving upwards which means its y velocity
is greater than zero
            if (rb.velocity.y > 0)
            // we add a bit of downward force to keep the player
constantly on the slope
                rb.AddForce(Vector3.down * 80f, ForceMode.Force);
        }
```

Code

PlayerMovementAdvanced.cs

```
using System.Collections;
using System.Collections.Generic;
using UnityEngine;
using TMPro;

public class PlayerMovementAdvanced : MonoBehaviour
{
    [Header("Movement")]
    private float moveSpeed;
    public float walkSpeed;
    public float sprintSpeed;

    public float groundDrag;

    [Header("Jumping")]
    public float jumpForce;
    public float jumpCooldown;
    public float airMultiplier;
    bool readyToJump;
```

```
    [Header("Crouching")]
    public float crouchSpeed;
    public float crouchYScale;
    private float startYScale;

    [Header("Keybinds")]
    public KeyCode jumpKey = KeyCode.Space;
    public KeyCode sprintKey = KeyCode.LeftShift;
    public KeyCode crouchKey = KeyCode.LeftControl;

    [Header("Ground Check")]
    public float playerHeight;
    public LayerMask whatIsGround;
    bool grounded;

    [Header("Slope Handling")]
    public float maxSlopeAngle;
    private RaycastHit slopeHit;
    private bool exitingSlope;


    public Transform orientation;

    float horizontalInput;
    float verticalInput;

    Vector3 moveDirection;

    Rigidbody rb;

    public MovementState state;
    public enum MovementState
    {
        walking,
        sprinting,
        crouching,
        air
    }

    private void Start()
```

```
    {
        rb = GetComponent<Rigidbody>();
        rb.freezeRotation = true;

        readyToJump = true;

        startYScale = transform.localScale.y;
    }

    private void Update()
    {
        // ground check
        grounded = Physics.Raycast(transform.position, Vector3.down,
playerHeight * 0.5f + 0.2f, whatIsGround);

        MyInput();
        SpeedControl();
        StateHandler();

        // handle drag
        if (grounded)
            rb.drag = groundDrag;
        else
            rb.drag = 0;
    }

    private void FixedUpdate()
    {
        MovePlayer();
    }

    private void MyInput()
    {
        horizontalInput = Input.GetAxisRaw("Horizontal");
        verticalInput = Input.GetAxisRaw("Vertical");

        // when to jump
        if(Input.GetKey(jumpKey) && readyToJump && grounded)
        {
            readyToJump = false;
```

```
            Jump();

            Invoke(nameof(ResetJump), jumpCooldown);
        }

        // start crouch
        if (Input.GetKeyDown(crouchKey))
        {
            transform.localScale = new Vector3(transform.localScale.x,
crouchYScale, transform.localScale.z);
            rb.AddForce(Vector3.down * 5f, ForceMode.Impulse);
        }

        // stop crouch
        if (Input.GetKeyUp(crouchKey))
        {
            transform.localScale = new Vector3(transform.localScale.x,
startYScale, transform.localScale.z);
        }
    }

    private void StateHandler()
    {
        // Mode - Crouching
        if (Input.GetKey(crouchKey))
        {
            state = MovementState.crouching;
            moveSpeed = crouchSpeed;
        }

        // Mode - Sprinting
        else if(grounded && Input.GetKey(sprintKey))
        {
            state = MovementState.sprinting;
            moveSpeed = sprintSpeed;
        }

        // Mode - Walking
        else if (grounded)
```

```
        {
            state = MovementState.walking;
            moveSpeed = walkSpeed;
        }

        // Mode - Air
        else
        {
            state = MovementState.air;
        }
    }

    private void MovePlayer()
    {
        // calculate movement direction
        moveDirection = orientation.forward * verticalInput +
orientation.right * horizontalInput;

        // on slope
        if (OnSlope() && !exitingSlope)
        {
            rb.AddForce(GetSlopeMoveDirection() * moveSpeed * 20f,
ForceMode.Force);

            // since we turn off the gravity on slope
            // if the player is moving upwards which means its y velocity
is greater than zero
            if (rb.velocity.y > 0)
            // we add a bit of downward force to keep the player
constantly on the slope
                rb.AddForce(Vector3.down * 80f, ForceMode.Force);
        }

        // on ground
        else if(grounded)
            rb.AddForce(moveDirection.normalized * moveSpeed * 10f,
ForceMode.Force);

        // in air
        else if(!grounded)
```

```
            rb.AddForce(moveDirection.normalized * moveSpeed * 10f *
airMultiplier, ForceMode.Force);

        // turn gravity off while on slope
        rb.useGravity = !OnSlope();
    }

    private void SpeedControl()
    {
        // limiting speed on slope
        if (OnSlope() && !exitingSlope)
        {
            if (rb.velocity.magnitude > moveSpeed)
                rb.velocity = rb.velocity.normalized * moveSpeed;
        }

        // limiting speed on ground or in air
        else
        {
            Vector3 flatVel = new Vector3(rb.velocity.x, 0f,
rb.velocity.z);

            // limit velocity if needed
            if (flatVel.magnitude > moveSpeed)
            {
                Vector3 limitedVel = flatVel.normalized * moveSpeed;
                rb.velocity = new Vector3(limitedVel.x, rb.velocity.y,
limitedVel.z);
            }
        }
    }

    private void Jump()
    {
        exitingSlope = true;

        // reset y velocity
        rb.velocity = new Vector3(rb.velocity.x, 0f, rb.velocity.z);

        rb.AddForce(transform.up * jumpForce, ForceMode.Impulse);
```

```
    }
    private void ResetJump()
    {
        readyToJump = true;

        exitingSlope = false;
    }

    private bool OnSlope()
    {
        if(Physics.Raycast(transform.position, Vector3.down, out slopeHit,
playerHeight * 0.5f + 0.3f))
        {
            // Calculate the angle between the player's direction and the
surface normal
            float angle = Vector3.Angle(Vector3.up, slopeHit.normal);

            // Determine if the angle is within the acceptable slope range
            return angle < maxSlopeAngle && angle != 0;
        }
        return false;
    }

    private Vector3 GetSlopeMoveDirection()
    {
        return Vector3.ProjectOnPlane(moveDirection,
slopeHit.normal).normalized;
    }
}
```

ADVANCED SLIDING IN 9 MINUTES - Unity Tutorial

https://www.youtube.com/watch?v=SsckrYYxcuM

To make your players slide in any direction,
As well as how to slide down slopes
Build up speed while doing so

Sliding.cs

```
    [Header("References")]
    public Transform orientation; // just an empty game object that keeps track of where the player is looking
    public Transform playerObj; // transform of playerObj
    private Rigidbody rb;
    private PlayerMovementAdvanced pm; // Also reference your movement script
```

```
    [Header("Sliding")]
    public float maxSlideTime; // for maximum time you're allowed to slide
    public float slideForce; // the slide force
    private float slideTimer; // a timer to check how long you've been sliding already

    public float slideYScale; // to shrink the player down while sliding
    private float startYScale; // reset the slide y scale after slide
```

```
    [Header("Input")]
    public KeyCode slideKey = KeyCode.LeftControl; // define key code for slide key
    private float horizontalInput; // also direction input
    private float verticalInput;
```

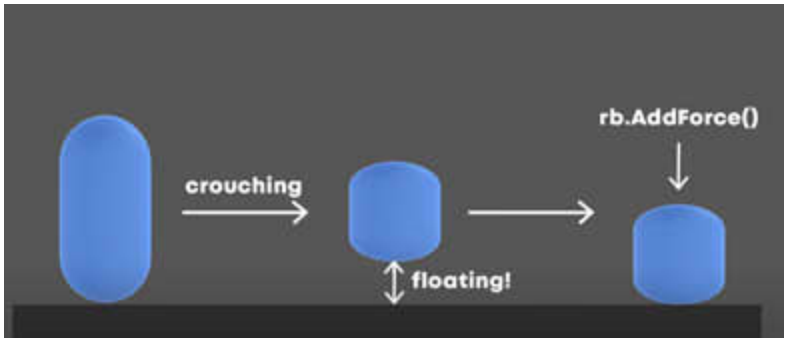
```
    private void Start()
    {
        rb = GetComponent<Rigidbody>(); // get rigidbody component
        pm = GetComponent<PlayerMovementAdvanced>(); // get movement script
// save y scale of player for crouch and sliding
```

```
        startYScale = playerObj.localScale.y;     }
```

```
    private void Update()
    {
        horizontalInput = Input.GetAxisRaw("Horizontal");
        verticalInput = Input.GetAxisRaw("Vertical");

        if (Input.GetKeyDown(slideKey) && (horizontalInput != 0 ||
verticalInput != 0))
            StartSlide(); // call slide if slide key down with direction
down

        if (Input.GetKeyUp(slideKey) && pm.sliding)
            StopSlide(); // stop slide if slide key up and in slide state
    }
```

```
    private void FixedUpdate()
    {
        if (pm.sliding)
            SlidingMovement(); // while is sliding, call function
    }
```

```
    private void StartSlide()
    { // when do slide
        pm.sliding = true; // set the bool sliding in Movement.cs true
// only change the y scale while leaving x and z scale as they are
        playerObj.localScale = new Vector3(playerObj.localScale.x,
slideYScale, playerObj.localScale.z);
        rb.AddForce(Vector3.down * 5f, ForceMode.Impulse);
// add down force to push rb down, because of floating
        slideTimer = maxSlideTime; // reset the slide timer
    }
```




```
    private void SlidingMovement() // apply sliding force here
    { // calculate the input direction, forward direction of the player * your vertical input + right direction of your player * your horizontal input
        Vector3 inputDirection = orientation.forward * verticalInput + orientation.right * horizontalInput;
// this way you can slide in all directions depending on which keys you're pressing

        // sliding normal
        if(!pm.OnSlope() || rb.velocity.y > -0.1f)
        { // apply force in the calculated direction
// use normalized input direction
            rb.AddForce(inputDirection.normalized * slideForce, ForceMode.Force);
// while sliding, count down your slide timer
            slideTimer -= Time.deltaTime;
        }

        // sliding down a slope
        else
        {
            rb.AddForce(pm.GetSlopeMoveDirection(inputDirection) * slideForce, ForceMode.Force);
        }
// call stop slide function if slidetimer reaches zero
        if (slideTimer <= 0)
            StopSlide(); // call for set the bool pm.sliding to false
    }
```

```
    private void StopSlide()
```

```
    {
        pm.sliding = false; // call for set the bool pm.sliding to false
// reset player y scale back to normal
        playerObj.localScale = new Vector3(playerObj.localScale.x,
startYScale, playerObj.localScale.z);
    }
```

https://youtu.be/SsckrYYxcuM?si=ewtY7aU6V9Kd5FvD&t=228

To fix sliding down slopes bumping movement
https://youtu.be/SsckrYYxcuM?si=dL4A24IQl61oMEMK&t=260

```
    private void SlidingMovement()
    {
        Vector3 inputDirection = orientation.forward * verticalInput +
orientation.right * horizontalInput;

        // sliding normal
        if(!pm.OnSlope() || rb.velocity.y > -0.1f)
        {
// this will only be executed when the player is not on a slope or moving
upwards
            rb.AddForce(inputDirection.normalized * slideForce,
ForceMode.Force);

            slideTimer -= Time.deltaTime;
        }
        // sliding down a slope
        else
        {
// when the player is on a slope and moving downwards, you want to apply
the force in the slope movement direction
            rb.AddForce(pm.GetSlopeMoveDirection(inputDirection) *
slideForce, ForceMode.Force);
        }

        if (slideTimer <= 0)
            StopSlide();
    }
```

https://youtu.be/SsckrYYxcuM?si=--kekHN1K8Bn_hbI&t=337

Build up speed over time

```
    [Header("Movement")]
    private float moveSpeed;
    public float walkSpeed;
    public float sprintSpeed;

    public float slideSpeed; // new
    private float desiredMoveSpeed; // new
    private float lastDesiredMoveSpeed; // new
```

```
    public enum MovementState
    {
        walking,
        sprinting,
        crouching,
        sliding, // new
        air
    }

    public bool sliding; // new
```

```
    private void StateHandler()
    {
        // Mode - Sliding
        if (sliding) // new
        {
            state = MovementState.sliding;
// if player is on slope and move downwards, set desiredMoveSpeed to
slideSpeed
            if (OnSlope() && rb.velocity.y < 0.1f)
                desiredMoveSpeed = slideSpeed;

            else
                desiredMoveSpeed = sprintSpeed;
        }

        // Mode - Crouching
        else if
```

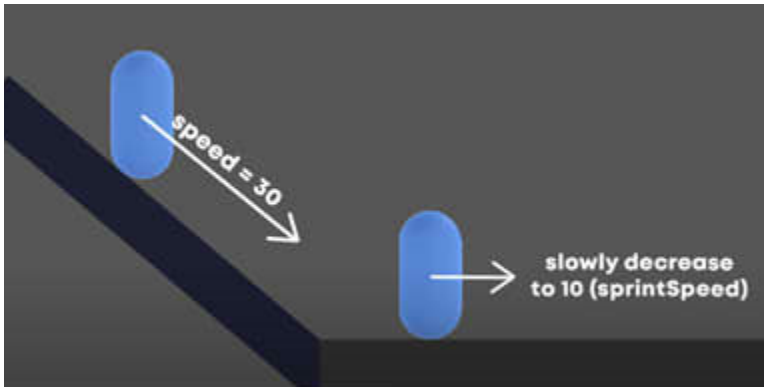
Change moveSpeed variables in PlayerMovementAdvanced.cs to desiredMovement.
The reason for change is that we're now implementing momentum冲力 into our game.

To handle Speed Limitations differently

https://youtu.be/SsckrYYxcuM?si=G7qPM6wd0ddf7iJ8&t=398

For example

If the player builds up a speed of 30 on a slope, and then hits the ground.
You don't want the speed to instantly drop to 10.
Instead it should slowly decrease.



For this, we're going to use Mathf.Lerp inside of this simple quarantine隔离
This script **changing** the **movespeed** variable to **desiredMoveSpeed** (**overtime**)

```
    private IEnumerator SmoothlyLerpMoveSpeed()
    {
        // smoothly lerp movementSpeed to desired value
        float time = 0;
        float difference = Mathf.Abs(desiredMoveSpeed - moveSpeed);
        float startValue = moveSpeed;

        while (time < difference)
        {
            moveSpeed = Mathf.Lerp(startValue, desiredMoveSpeed, time /
difference);

            if (OnSlope())
            {
```

```
                float slopeAngle = Vector3.Angle(Vector3.up,
slopeHit.normal);
                float slopeAngleIncrease = 1 + (slopeAngle / 90f);

                time += Time.deltaTime * speedIncreaseMultiplier *
slopeIncreaseMultiplier * slopeAngleIncrease;
            }
            else
                time += Time.deltaTime * speedIncreaseMultiplier;

            yield return null;
        }

        moveSpeed = desiredMoveSpeed;
    }
```

Save the last desired move speed at the end of the state handler,
And check if the difference of the desiredMovespeed to the last desired movespeed is greater than 4.
If so, start coroutine
If not, set the value directly

```
    private void StateHandler()
    {// TL;DR
        // Mode - Air
        else
        {
            state = MovementState.air;
        }

        // check if desiredMoveSpeed has changed drastically
        if(Mathf.Abs(desiredMoveSpeed - lastDesiredMoveSpeed) > 4f &&
moveSpeed != 0)
        {
            StopAllCoroutines();
            StartCoroutine(SmoothlyLerpMoveSpeed());
        }
        else
        {
```

```
            moveSpeed = desiredMoveSpeed;
        }

        lastDesiredMoveSpeed = desiredMoveSpeed;
    }
```

https://youtu.be/SsckrYYxcuM?si=pTW7nkEPoFcFUUkW&t=457

Why only change it if the difference is Greater than 4f?

check if the difference of the desiredMovespeed to the last desired movespeed is greater than 4.

```
        // check if desiredMoveSpeed has changed drastically
        if(Mathf.Abs(desiredMoveSpeed - lastDesiredMoveSpeed) > 4f &&
moveSpeed != 0)
```

If you're changing from walking to sprinting, the speed difference is only 3.
Therefore the speed changes instantly.

But if you build up a speed of 30, and you're changing to sprinting, the difference is 20, which is greater than 4, which means the speed will now slowly decrease.

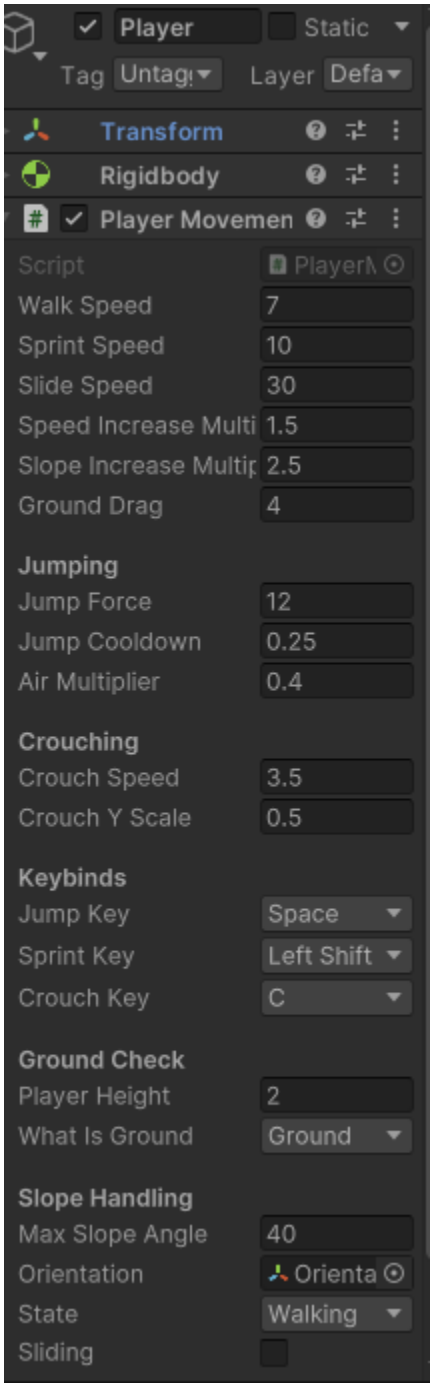
This way you have it both.
On one side, you can quickly change between sprinting and walking.
On the other side, you slowly change between going really fast and really slow.
You're able to keep your momentum动量 冲力

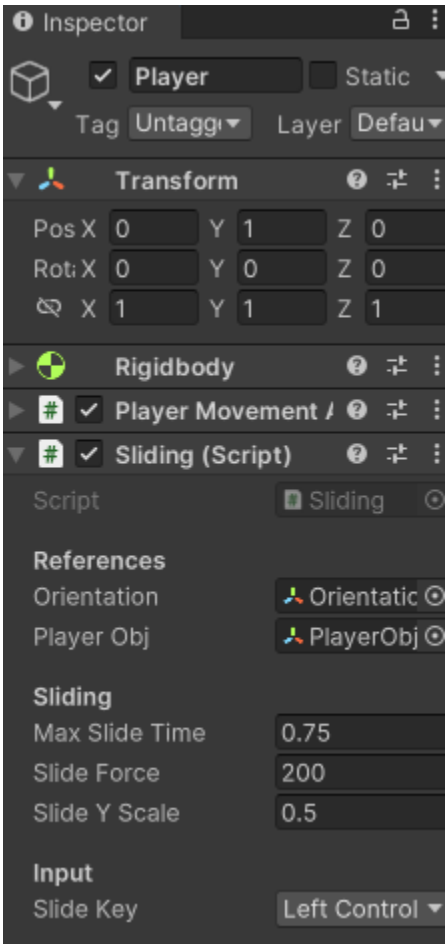
Set your value
https://youtu.be/SsckrYYxcuM?si=9DPOQxtaA32N6jYK&t=505

https://youtu.be/SsckrYYxcuM?si=KMVfsj4jHZNQycpA&t=516
Build up more speed depending on how steep the slope is

```
    [Header("Movement")]
// TL;DL
    public float speedIncreaseMultiplier; // new
    public float slopeIncreaseMultiplier; // new
```

Value for Script





Problem:

Rig does not rotate as PlayerCam's rotation.
Cannot jump on a very steep slope in any direction.
It won’t count steep slopes as being on the ground.
Always in the air on steep slopes.

Code

Sliding.cs

```
using System.Collections;
using System.Collections.Generic;
using UnityEngine;

public class Sliding : MonoBehaviour
{
    [Header("References")]
    public Transform orientation;
    public Transform playerObj;
    private Rigidbody rb;
    private PlayerMovementAdvanced pm;

    [Header("Sliding")]
    public float maxSlideTime;
    public float slideForce;
    private float slideTimer;

    public float slideYScale;
    private float startYScale;

    [Header("Input")]
    public KeyCode slideKey = KeyCode.LeftControl;
    private float horizontalInput;
    private float verticalInput;


    private void Start()
    {
        rb = GetComponent<Rigidbody>();
        pm = GetComponent<PlayerMovementAdvanced>();

        startYScale = playerObj.localScale.y;
    }

    private void Update()
    {
```

```
        horizontalInput = Input.GetAxisRaw("Horizontal");
        verticalInput = Input.GetAxisRaw("Vertical");

        if (Input.GetKeyDown(slideKey) && (horizontalInput != 0 ||
verticalInput != 0))
            StartSlide();

        if (Input.GetKeyUp(slideKey) && pm.sliding)
            StopSlide();
    }

    private void FixedUpdate()
    {
        if (pm.sliding)
            SlidingMovement();
    }

    private void StartSlide()
    {
        pm.sliding = true;

        playerObj.localScale = new Vector3(playerObj.localScale.x,
slideYScale, playerObj.localScale.z);
        rb.AddForce(Vector3.down * 5f, ForceMode.Impulse);

        slideTimer = maxSlideTime;
    }

    private void SlidingMovement()
    {
        Vector3 inputDirection = orientation.forward * verticalInput +
orientation.right * horizontalInput;

        // sliding normal
        if(!pm.OnSlope() || rb.velocity.y > -0.1f)
        {
            rb.AddForce(inputDirection.normalized * slideForce,
ForceMode.Force);

            slideTimer -= Time.deltaTime;
```

```
        }

        // sliding down a slope
        else
        {
            rb.AddForce(pm.GetSlopeMoveDirection(inputDirection) *
slideForce, ForceMode.Force);
        }

        if (slideTimer <= 0)
            StopSlide();
    }

    private void StopSlide()
    {
        pm.sliding = false;

        playerObj.localScale = new Vector3(playerObj.localScale.x,
startYScale, playerObj.localScale.z);
    }
}
```

PlayerMovementAdvanced.cs

```
using System.Collections;
using System.Collections.Generic;
using UnityEngine;
using TMPro;

public class PlayerMovementAdvanced : MonoBehaviour
{
    [Header("Movement")]
    private float moveSpeed;
    public float walkSpeed;
    public float sprintSpeed;

    public float slideSpeed; // new
    private float desiredMoveSpeed; // new
    private float lastDesiredMoveSpeed; // new
```

```
    public float speedIncreaseMultiplier; // new
    public float slopeIncreaseMultiplier; // new

    public float groundDrag;

    [Header("Jumping")]
    public float jumpForce;
    public float jumpCooldown;
    public float airMultiplier;
    bool readyToJump;

    [Header("Crouching")]
    public float crouchSpeed;
    public float crouchYScale;
    private float startYScale;

    [Header("Keybinds")]
    public KeyCode jumpKey = KeyCode.Space;
    public KeyCode sprintKey = KeyCode.LeftShift;
    public KeyCode crouchKey = KeyCode.LeftControl;

    [Header("Ground Check")]
    public float playerHeight;
    public LayerMask whatIsGround;
    bool grounded;

    [Header("Slope Handling")]
    public float maxSlopeAngle;
    private RaycastHit slopeHit;
    private bool exitingSlope;


    public Transform orientation;

    float horizontalInput;
    float verticalInput;

    Vector3 moveDirection;

    Rigidbody rb;
```

```
    public MovementState state;
    public enum MovementState
    {
        walking,
        sprinting,
        crouching,
        sliding, // new
        air
    }

    public bool sliding; // new

    private void Start()
    {
        rb = GetComponent<Rigidbody>();
        rb.freezeRotation = true;

        readyToJump = true;

        startYScale = transform.localScale.y;
    }

    private void Update()
    {
        // ground check
        grounded = Physics.Raycast(transform.position, Vector3.down,
playerHeight * 0.5f + 0.2f, whatIsGround);

        MyInput();
        SpeedControl();
        StateHandler();

        // handle drag
        if (grounded)
            rb.drag = groundDrag;
        else
            rb.drag = 0;
    }
```

```
    private void FixedUpdate()
    {
        MovePlayer();
    }

    private void MyInput()
    {
        horizontalInput = Input.GetAxisRaw("Horizontal");
        verticalInput = Input.GetAxisRaw("Vertical");

        // when to jump
        if(Input.GetKey(jumpKey) && readyToJump && grounded)
        {
            readyToJump = false;

            Jump();

            Invoke(nameof(ResetJump), jumpCooldown);
        }

        // start crouch
        if (Input.GetKeyDown(crouchKey))
        {
            transform.localScale = new Vector3(transform.localScale.x,
crouchYScale, transform.localScale.z);
            rb.AddForce(Vector3.down * 5f, ForceMode.Impulse);
        }

        // stop crouch
        if (Input.GetKeyUp(crouchKey))
        {
            transform.localScale = new Vector3(transform.localScale.x,
startYScale, transform.localScale.z);
        }
    }

    private void StateHandler()
    {
        // Mode - Sliding
        if (sliding) // new
```

```
        {
            state = MovementState.sliding;

            if (OnSlope() && rb.velocity.y < 0.1f)
                desiredMoveSpeed = slideSpeed;

            else
                desiredMoveSpeed = sprintSpeed;
        }

        // Mode - Crouching
        else if (Input.GetKey(crouchKey)) // change to else if
        {
            state = MovementState.crouching;
            desiredMoveSpeed = crouchSpeed; // moveSpeed to
desiredMoveSpeed
        }

        // Mode - Sprinting
        else if(grounded && Input.GetKey(sprintKey))
        {
            state = MovementState.sprinting;
            desiredMoveSpeed = sprintSpeed; // moveSpeed to
desiredMoveSpeed
        }

        // Mode - Walking
        else if (grounded)
        {
            state = MovementState.walking;
            desiredMoveSpeed = walkSpeed;
        }

        // Mode - Air
        else
        {
            state = MovementState.air;
        }

        // check if desiredMoveSpeed has changed drastically
```

```
        if(Mathf.Abs(desiredMoveSpeed - lastDesiredMoveSpeed) > 4f &&
moveSpeed != 0)
        {
            StopAllCoroutines();
            StartCoroutine(SmoothlyLerpMoveSpeed());
        }
        else
        {
            moveSpeed = desiredMoveSpeed;
        }

        lastDesiredMoveSpeed = desiredMoveSpeed;
    }

    private IEnumerator SmoothlyLerpMoveSpeed()
    {
        // smoothly lerp movementSpeed to desired value
        float time = 0;
        float difference = Mathf.Abs(desiredMoveSpeed - moveSpeed);
        float startValue = moveSpeed;

        while (time < difference)
        {
            moveSpeed = Mathf.Lerp(startValue, desiredMoveSpeed, time /
difference);

            if (OnSlope())
            {
                float slopeAngle = Vector3.Angle(Vector3.up,
slopeHit.normal);
                float slopeAngleIncrease = 1 + (slopeAngle / 90f);

                time += Time.deltaTime * speedIncreaseMultiplier *
slopeIncreaseMultiplier * slopeAngleIncrease;
            }
            else
                time += Time.deltaTime * speedIncreaseMultiplier;

            yield return null;
        }
```

```
        moveSpeed = desiredMoveSpeed;
    }

    private void MovePlayer()
    {
        // calculate movement direction
        moveDirection = orientation.forward * verticalInput +
orientation.right * horizontalInput;

        // on slope
        if (OnSlope() && !exitingSlope)
        {
            rb.AddForce(GetSlopeMoveDirection(moveDirection) * moveSpeed *
20f, ForceMode.Force);

            // since we turn off the gravity on slope
            // if the player is moving upwards which means its y velocity
is greater than zero
            if (rb.velocity.y > 0)
            // we add a bit of downward force to keep the player
constantly on the slope
                rb.AddForce(Vector3.down * 80f, ForceMode.Force);
        }

        // on ground
        else if(grounded)
            rb.AddForce(moveDirection.normalized * moveSpeed * 10f,
ForceMode.Force);

        // in air
        else if(!grounded)
            rb.AddForce(moveDirection.normalized * moveSpeed * 10f *
airMultiplier, ForceMode.Force);

        // turn gravity off while on slope
        rb.useGravity = !OnSlope();
    }

    private void SpeedControl()
```

```
    {
        // limiting speed on slope
        if (OnSlope() && !exitingSlope)
        {
            if (rb.velocity.magnitude > moveSpeed)
                rb.velocity = rb.velocity.normalized * moveSpeed;
        }

        // limiting speed on ground or in air
        else
        {
            Vector3 flatVel = new Vector3(rb.velocity.x, 0f,
rb.velocity.z);

            // limit velocity if needed
            if (flatVel.magnitude > moveSpeed)
            {
                Vector3 limitedVel = flatVel.normalized * moveSpeed;
                rb.velocity = new Vector3(limitedVel.x, rb.velocity.y,
limitedVel.z);
            }
        }
    }

    private void Jump()
    {
        exitingSlope = true;

        // reset y velocity
        rb.velocity = new Vector3(rb.velocity.x, 0f, rb.velocity.z);

        rb.AddForce(transform.up * jumpForce, ForceMode.Impulse);
    }
    private void ResetJump()
    {
        readyToJump = true;

        exitingSlope = false;
    }
```

```
    public bool OnSlope()
    {
        if(Physics.Raycast(transform.position, Vector3.down, out slopeHit,
playerHeight * 0.5f + 0.3f))
        {
            // Calculate the angle between the player's direction and the
surface normal
            float angle = Vector3.Angle(Vector3.up, slopeHit.normal);

            // Determine if the angle is within the acceptable slope range
            return angle < maxSlopeAngle && angle != 0;
        }
        return false;
    }

    public Vector3 GetSlopeMoveDirection(Vector3 direction)
    {
        return Vector3.ProjectOnPlane(direction,
slopeHit.normal).normalized;
    }
}
```

PlayerMovemetAdvanced.cs Another solution

```
using System.Collections;
using UnityEngine;

public class PlayerMovementAdvanced : MonoBehaviour
{
    [Header("Movement")]
    private float moveSpeed;
    public float walkSpeed;
    public float sprintSpeed;
    public float slideSpeed;
    private float desiredMoveSpeed;
    private float lastDesiredMoveSpeed;
    public float speedIncreaseMultiplier;
    public float slopeIncreaseMultiplier;
    public float groundDrag;
```

```
    [Header("Jumping")]
    public float jumpForce;
    public float jumpCooldown;
    public float airMultiplier;
    private bool readyToJump = true;

    [Header("Crouching")]
    public float crouchSpeed;
    public float crouchYScale;
    private float startYScale;

    [Header("Keybinds")]
    public KeyCode jumpKey = KeyCode.Space;
    public KeyCode sprintKey = KeyCode.LeftShift;
    public KeyCode crouchKey = KeyCode.LeftControl;

    [Header("Ground Check")]
    public float playerHeight;
    public LayerMask whatIsGround;
    private bool grounded;
    private bool onSteepGround;

    [Header("Slope Handling")]
    public float maxSlopeAngle;
    private RaycastHit slopeHit;
    private bool exitingSlope;

    public Transform orientation;
    private Rigidbody rb;
    private Vector3 moveDirection;
    public MovementState state;
    public enum MovementState
    {
        walking,
        sprinting,
        crouching,
        sliding,
        air
    }
    public bool sliding;
```

```
private void Start()
{
    rb = GetComponent<Rigidbody>();
    rb.freezeRotation = true;
    startYScale = transform.localScale.y;
}

private void Update()
{
    GroundCheck();
    MyInput();
    SpeedControl();
    StateHandler();
    rb.drag = grounded ? groundDrag : 0;
}

private void FixedUpdate()
{
    MovePlayer();
}

private void MyInput()
{
    horizontalInput = Input.GetAxisRaw("Horizontal");
    verticalInput = Input.GetAxisRaw("Vertical");

    if (Input.GetKeyUp(jumpKey) && !grounded && onSteepGround)
        Jump();

    if (Input.GetKey(jumpKey) && readyToJump && grounded)
    {
        readyToJump = false;
        Jump();
        Invoke(nameof(ResetJump), jumpCooldown);
    }

    if (Input.GetKeyDown(crouchKey))
    {
```

```
            transform.localScale = new Vector3(transform.localScale.x,
crouchYScale, transform.localScale.z);
            rb.AddForce(Vector3.down * 5f, ForceMode.Impulse);
        }

        if (Input.GetKeyUp(crouchKey))
            transform.localScale = new Vector3(transform.localScale.x,
startYScale, transform.localScale.z);
    }

    private void StateHandler()
    {
        if (sliding)
        {
            state = MovementState.sliding;
            desiredMoveSpeed = OnSlope() && rb.velocity.y < 0.1f ?
slideSpeed : sprintSpeed;
        }
        else if (Input.GetKey(crouchKey))
        {
            state = MovementState.crouching;
            desiredMoveSpeed = crouchSpeed;
        }
        else if (grounded && Input.GetKey(sprintKey))
        {
            state = MovementState.sprinting;
            desiredMoveSpeed = sprintSpeed;
        }
        else if (grounded)
        {
            state = MovementState.walking;
            desiredMoveSpeed = walkSpeed;
        }
        else
            state = MovementState.air;

        if (Mathf.Abs(desiredMoveSpeed - lastDesiredMoveSpeed) > 4f &&
moveSpeed != 0)
        {
            StopAllCoroutines();
```

```
            StartCoroutine(SmoothlyLerpMoveSpeed());
        }
        else
            moveSpeed = desiredMoveSpeed;

        lastDesiredMoveSpeed = desiredMoveSpeed;
    }

    private IEnumerator SmoothlyLerpMoveSpeed()
    {
        float time = 0;
        float difference = Mathf.Abs(desiredMoveSpeed - moveSpeed);
        float startValue = moveSpeed;

        while (time < difference)
        {
            moveSpeed = Mathf.Lerp(startValue, desiredMoveSpeed, time /
difference);

            if (OnSlope())
            {
                float slopeAngle = Vector3.Angle(Vector3.up,
slopeHit.normal);
                float slopeAngleIncrease = 1 + (slopeAngle / 90f);
                time += Time.deltaTime * speedIncreaseMultiplier *
slopeIncreaseMultiplier * slopeAngleIncrease;
            }
            else
                time += Time.deltaTime * speedIncreaseMultiplier;

            yield return null;
        }

        moveSpeed = desiredMoveSpeed;
    }

    private void MovePlayer()
    {
        moveDirection = orientation.forward * verticalInput +
orientation.right * horizontalInput;
```

```
        if (OnSlope() && !exitingSlope)
        {
            rb.AddForce(GetSlopeMoveDirection(moveDirection) * moveSpeed *
20f, ForceMode.Force);
            if (rb.velocity.y > 0)
                rb.AddForce(Vector3.down * 80f, ForceMode.Force);
        }
        else if (grounded)
            rb.AddForce(moveDirection.normalized * moveSpeed * 10f,
ForceMode.Force);
        else if (!grounded)
            rb.AddForce(moveDirection.normalized * moveSpeed * 10f *
airMultiplier, ForceMode.Force);

        rb.useGravity = !OnSlope();
    }

    private void SpeedControl()
    {
        if (OnSlope() && !exitingSlope && rb.velocity.magnitude >
moveSpeed)
            rb.velocity = rb.velocity.normalized * moveSpeed;
        else
        {
            Vector3 flatVel = new Vector3(rb.velocity.x, 0f,
rb.velocity.z);
            if (flatVel.magnitude > moveSpeed)
            {
                Vector3 limitedVel = flatVel.normalized * moveSpeed;
                rb.velocity = new Vector3(limitedVel.x, rb.velocity.y,
limitedVel.z);
            }
        }
    }

    private void Jump()
    {
        exitingSlope = true;
        rb.velocity = new Vector3(rb.velocity.x, 0f, rb.velocity.z);
```

```
        rb.AddForce(transform.up * jumpForce, ForceMode.Impulse);
    }

    private void ResetJump()
    {
        readyToJump = true;
        exitingSlope = false;
    }

    public bool OnSlope()
    {
        if (Physics.Raycast(transform.position, Vector3.down, out
slopeHit, playerHeight * 0.5f + 0.3f))
            return Vector3.Angle(Vector3.up, slopeHit.normal) <
maxSlopeAngle && slopeHit.normal != Vector3.up;
        return false;
    }

    public Vector3 GetSlopeMoveDirection(Vector3 direction)
    {
        return Vector3.ProjectOnPlane(direction,
slopeHit.normal).normalized;
    }

    private void GroundCheck()
    {
        RaycastHit hit;
        if (Physics.Raycast(transform.position, Vector3.down, out hit,
playerHeight * 0.5f + 0.2f, whatIsGround))
        {
            grounded = true;
            onSteepGround = Vector3.Angle(hit.normal, Vector3.up) >
maxSlopeAngle;
        }
        else
        {
            grounded = false;
            onSteepGround = false;
        }
    }
```

```
}
```

ADVANCED WALL RUNNING - Unity Tutorial (Remastered)

https://www.youtube.com/watch?v=gNt9wBOrQO4

to learn how to code wall running that feels great,
can be controlled in multiple directions works with or without gravity
and even on curved walls well search no more in this tutorial

need two layer masks
to define what is ground and what is wall

```
    [Header("Wallrunning")]
    public LayerMask whatIsWall;
    public LayerMask whatIsGround;
    public float wallRunForce;
    public float wallClimbSpeed;
    public float maxWallRunTime;
    private float wallRunTimer;
```

for the keyboard inputs all you need is
floats for the horizontal and vertical axis

```
    [Header("Input")]
    public KeyCode upwardsRunKey = KeyCode.LeftShift;
    public KeyCode downwardsRunKey = KeyCode.LeftControl;
    private bool upwardsRunning;
    private bool downwardsRunning;
    private float horizontalInput;
    private float verticalInput;
```

for the wall detection
create floats for the wall check distance
minimal jump height
as well as raycast hit variables
and booleans for the left and right side raycasts

```
    [Header("Detection")]
    public float wallCheckDistance;
    public float minJumpHeight;
    private RaycastHit leftWallhit;
    private RaycastHit rightWallhit;
    private bool wallLeft;
    private bool wallRight;
```

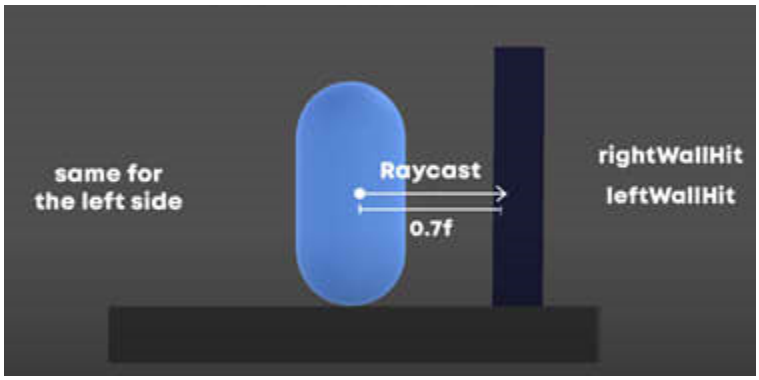
to get a reference to the rigid body
and orientation of the player
as well as one to your player movement script

```
    [Header("References")]
    public Transform orientation;
    private PlayerMovementAdvanced pm;
    private Rigidbody rb;
```

in void start
you can assign these references using the get component function

```
    private void Start()
    {
        rb = GetComponent<Rigidbody>();
        pm = GetComponent<PlayerMovementAdvanced>();
    }
```

https://youtu.be/gNt9wBOrQO4?si=c6Ju-lkzszAYUSg9&t=91
now before the player should start any wall running movement
you of course need **to check if there's even a wall in range**
we'll do this by shooting out raycasts
to the left and right side of the player
the distance is going to be the wall check distance
and we're going to store the information of the raycast
in the variables we created



create a function called CheckForWall()
and use physics.raycast like this to perform the wall check

```
Physics.Raycast(Start point, Direction, out rightWallhit, Distance,
whatIsWall);
```

```
    private void CheckForWall()
    {
```

```
        wallRight = Physics.Raycast(transform.position, orientation.right,
out rightWallhit, wallCheckDistance, whatIsWall);
        wallLeft = Physics.Raycast(transform.position, -orientation.right,
out leftWallhit, wallCheckDistance, whatIsWall);
    }
```

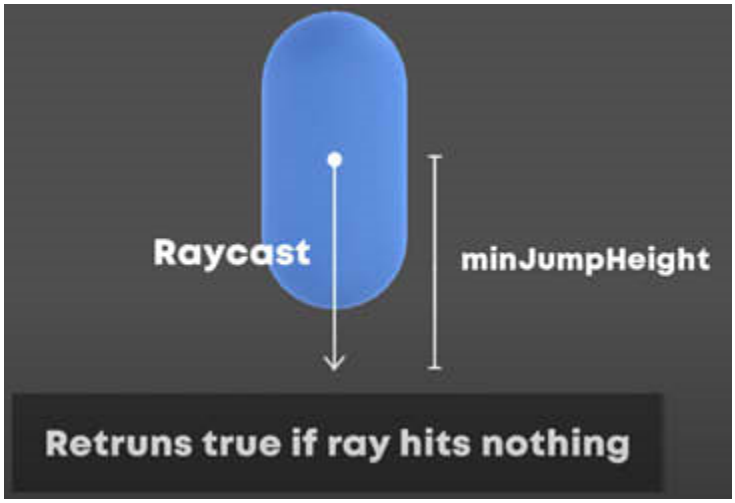
notice that this part stores the information of the object we hit for later

```
out rightWallhit
out RaycastHit hitInfo
```

also don't forget to call this CheckForWall() function
in void update

```
    private void Update()
    {
        CheckForWall();
        StateMachine();
    }
```

there's one more check we need to perform
which is checking if the player is high enough in the air to start wall running



so create this spool and it's the same as before
but this time the ray goes downwards and
don't forget that this time you want to return true if the ray hits nothing

```
    private bool AboveGround()
    {
```

```
        return !Physics.Raycast(transform.position, Vector3.down,
minJumpHeight, whatIsGround);
    }
```

next create a function called StateMachine()
and we'll start off by getting the horizontal and vertical keyboard inputs
and now we're basically going
to define when the player should enter the wall running state
the conditions for this are

1. there has to be a wall on the left or right side
2. you need to be pressing the w key
3. and the player has to be above the ground

if this is all true we want to start a wall run

```
    private void StateMachine()
    {
        // Getting Inputs
        horizontalInput = Input.GetAxisRaw("Horizontal");
        verticalInput = Input.GetAxisRaw("Vertical");

        upwardsRunning = Input.GetKey(upwardsRunKey);
        downwardsRunning = Input.GetKey(downwardsRunKey);

        // State 1 - Wallrunning
        if((wallLeft || wallRight) && verticalInput > 0 && AboveGround())
        {
            if (!pm.wallrunning)
                StartWallRun();
        }

        // State 3 - None
        else
        {
            if (pm.wallrunning)
                StopWallRun();
        }
    }
```

but for this we're going to need a few more functions
so create a StartWallRun() function

a StopWallRun() function and
also a function for the WallRunningMovement()

```
private void StartWallRun(){}
private void WallRunningMovement(){}
private void StopWallRun(){}
```

https://youtu.be/gNt9wBOrQO4?si=2vCOxAprqEKuNr4B&t=196
now before we continue you have to understand that
i usually handle all the speed limitations in the player movement script
and then add forces in separate scripts

so quickly open the movement script
And add a float for the wall run speed

```
    [Header("Movement")]
    private float moveSpeed;
    public float groundDrag;
    public float walkSpeed;
    public float sprintSpeed;

    public float slideSpeed;
    private float desiredMoveSpeed;
    private float lastDesiredMoveSpeed;
    public float speedIncreaseMultiplier;
    public float slopeIncreaseMultiplier;

    public float wallrunSpeed; // new
```

A state called wall running

```
    public enum MovementState
    {
        walking,
        sprinting,
        wallrunning, // new
        crouching,
        sliding,
```

```
        air
    }
```

and a bool with the same name

```
    public bool crouching;
    public bool sliding;
    public bool wallrunning; // new
```

now in the state handler you can easily
add this wall running state

```
    private void StateHandler()
    {
        // Mode - Wallrunning
        if (wallrunning)
        {
            state = MovementState.wallrunning;
            desiredMoveSpeed = wallrunSpeed;
        }
       // TL;DR
```

Now that the speed limit is set up

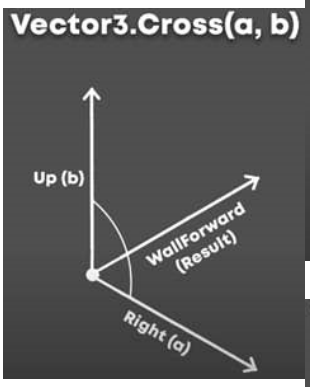
in StartWallRun()
you can just set the wall running bool of the player movement script to true

```
    private void StartWallRun()
    {
        pm.wallrunning = true;
    }
```

and now let's call the wall running movement

https://youtu.be/gNt9wBOrQO4?si=H-STyx4OcAC9BSKb&t=242
The hardest part here is
to find the forward direction of the wall
Because this has to work no matter how your wall is rotated

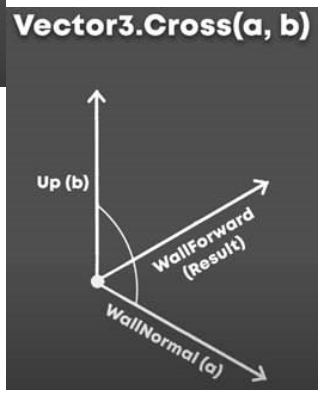
For this we're going to use vector3.cross
a function that takes in the right and upwards direction
and then returns the forward direction



now the right direction is also called the WallNormal

it's just a direction pointing away from the wall

and this one is easy to get
because we already stored the raycast hit information



https://youtu.be/gNt9wBOrQO4?si=L7DSxZsomJ2exU_z&t=273

```
    private void WallRunningMovement()
    {
        rb.useGravity = false;
        rb.velocity = new Vector3(rb.velocity.x, 0f, rb.velocity.z);

        Vector3 wallNormal = wallRight ? rightWallhit.normal :
leftWallhit.normal;

        Vector3 wallForward = Vector3.Cross(wallNormal, transform.up);

        if ((orientation.forward - wallForward).magnitude >
(orientation.forward - -wallForward).magnitude)
            wallForward = -wallForward;

        // forward force
        rb.AddForce(wallForward * wallRunForce, ForceMode.Force);

        // upwards/downwards force
```

```
        if (upwardsRunning)
            rb.velocity = new Vector3(rb.velocity.x, wallClimbSpeed,
rb.velocity.z);
        if (downwardsRunning)
            rb.velocity = new Vector3(rb.velocity.x, -wallClimbSpeed,
rb.velocity.z);

        // push to wall force
        if (!(wallLeft && horizontalInput > 0) && !(wallRight &&
horizontalInput < 0))
            rb.AddForce(-wallNormal * 100, ForceMode.Force);
    }
```

and for now we're just gonna turn the gravity off
and set the rigidbody's y velocity to zero

so just add the new vector3 called **wallNorma**l
and **if the wall is on the right** we want to use the **rightWallHit.normal**
otherwise the **leftWallHit.norma**l

and as explained for the **wallForward** we're just gonna use the **cross product** of the **wallNormal** and the upwards direction which is **transform.up**
now you can add force with **rigidbody**.**addforce** in the **wall forward direction Multiplied** with your **walRunForce** and using **ForceMode.Force**

https://youtu.be/gNt9wBOrQO4?si=vqLljVHCO7lTywnb&t=316
also in stopwall run you want
to set the wall running bool to false again

```
    private void StopWallRun()
    {
        pm.wallrunning = false;
    }
```

now obviously you need to call these functions somewhere
so go back to your state machine
and in the wall running state
Call StartWallRun()
and if you're not in this state
Call StopWallRun()

```
    private void StateMachine()
```

```
    {
// TD;DR
        // State 1 - Wallrunning
        if((wallLeft || wallRight) && verticalInput > 0 && AboveGround())
        {
            if (!pm.wallrunning)
                StartWallRun();
        }

        // State 3 - None
        else
        {
            if (pm.wallrunning)
                StopWallRun();
        }
    }
```

and now you can open FixedUpdate()
And while you're wall running
you can call the wall running movement function

```
    private void FixedUpdate()
    {
        if (pm.wallrunning)
            WallRunningMovement();
    }
```

also don't forget to call the StateMachine() in void Update

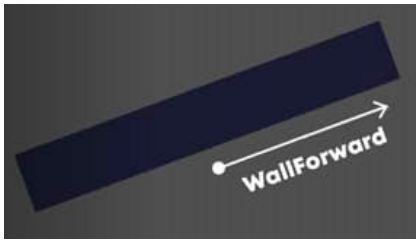
```
    private void Update()
    {
        CheckForWall();
        StateMachine();
    }
```

https://youtu.be/gNt9wBOrQO4?si=fI04WOj9xwK2qxyd&t=344

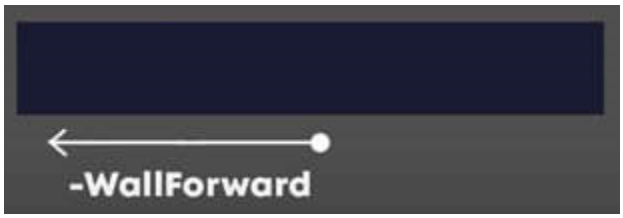
now switch to unity assign a wall run
speed add the wall running script and
also set the rest of the variables and
to keep it simple i'm just using whatisground for both layers
just make sure that your walls have the what is ground layer selected

https://youtu.be/gNt9wBOrQO4?si=ji6mKyD2k1r4-evr&t=365
if you're now at play you can see the wall run is already working
but if you try from the other side i'm wall running backwards

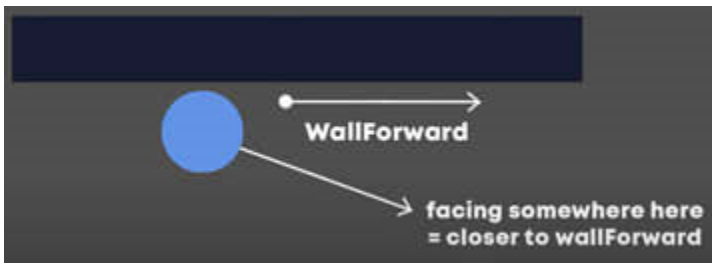
finding the forward direction is great



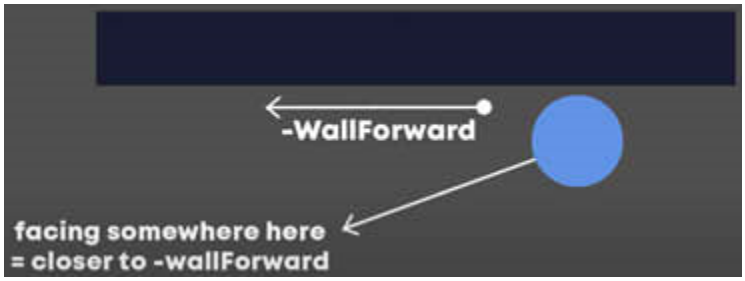
https://youtu.be/gNt9wBOrQO4?si=Y0uJGUlHgwx2CtD4&t=370
but sometimes we want to use the exact opposite



so basically if the player is facing somewhere here
we want to use the forward direction



whereas when the player is facing here
we want to use the backwards or minus forward direction



So backwards or minus forward direction

So add these two lines
to find out which direction is closer to where the player is facing

```
    private void WallRunningMovement()
```

```
    {
// TL;DR
        if ((orientation.forward - wallForward).magnitude >
(orientation.forward - -wallForward).magnitude)
            wallForward = -wallForward;
// TL;DR
    }
```

and there you go you can now wall run in both directions
and this even works on curved walls

however if you try to wall run on the
outside of a curved wall you lose contact

so quickly head back to your script and inside of the wall running movement function
you want to push your player towards the wall
by using rigidbody.addforce the opposite of the wallNormal times 100 and using ForceMode.Force

```
    private void WallRunningMovement()
    {
// TL;DR
        // push to wall force
        if (!(wallLeft && horizontalInput > 0) && !(wallRight &&
horizontalInput < 0))
            rb.AddForce(-wallNormal * 100, ForceMode.Force);
    }
```

and you only want to add this force
If the player is not currently trying to get away from the wall
which would mean there's a wall on the left
and he's pressing d or there's a wall on the right and he's pressing a

https://youtu.be/gNt9wBOrQO4?si=FXo1bguUUW-e3ET2&t=444
how to create diagonal wall running
which is really important because it gives the player a lot more control
so there's different ways how to code this
but what i recommend is to create key codes for upwards and downwards while running
in my case that would be shift and control
and then you also need two bools with similar names

```
    [Header("Input")]
    public KeyCode upwardsRunKey = KeyCode.LeftShift;
    public KeyCode downwardsRunKey = KeyCode.LeftControl;
    private bool upwardsRunning;
```

```
    private bool downwardsRunning;
```

and a float for the wall climb speed

```
    [Header("Wallrunning")]
    public float wallClimbSpeed;
```

in your state machine you can now assign the inputs like this

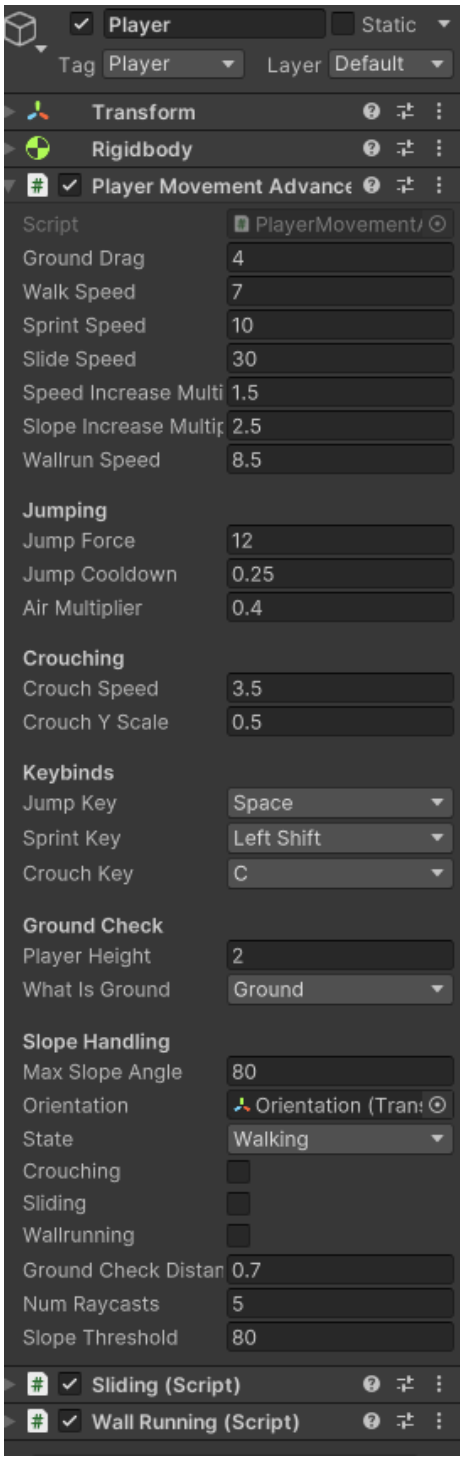
```
    private void StateMachine()
    {
// TL;DR
        upwardsRunning = Input.GetKey(upwardsRunKey);
        downwardsRunning = Input.GetKey(downwardsRunKey);
// TL;DR
        // State 1 - Wallrunning
    }
```

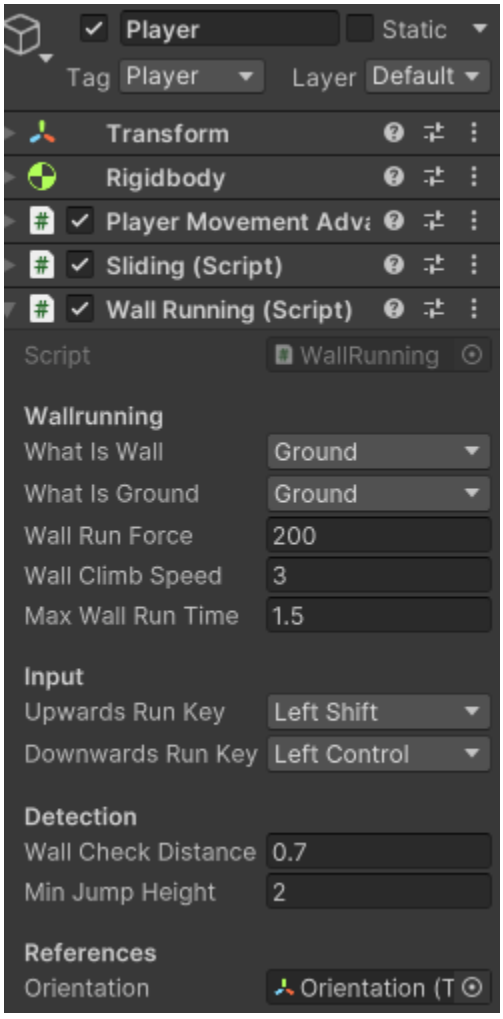
and in the wall running movement function when you want to run upwards
just set the y velocity of your rigidbody to your wall climb speed
and the opposite applies to when you want to run downwards

```
    private void WallRunningMovement()
    {
// TL;DR
        // upwards/downwards force
        if (upwardsRunning)
            rb.velocity = new Vector3(rb.velocity.x, wallClimbSpeed,
rb.velocity.z);
        if (downwardsRunning)
            rb.velocity = new Vector3(rb.velocity.x, -wallClimbSpeed,
rb.velocity.z);
        // push to wall force
// TL;DR
    }
```

now set the wall climb speed to something like 3 and there you go

Value


Player
Static
Tag Player
Layer Default
Transform
Rigidbody
Player Movement Advance
Script PlayerMovement
Ground Drag 4
Walk Speed 7
Sprint Speed 10
Slide Speed 30
Speed Increase Multi 1.5
Slope Increase Multip 2.5
Wallrun Speed 8.5
Jumping
Jump Force 12
Jump Cooldown 0.25
Air Multiplier 0.4
Crouching
Crouch Speed 3.5
Crouch Y Scale 0.5
Keybinds
Jump Key Space
Sprint Key Left Shift
Crouch Key C
Ground Check
Player Height 2
What Is Ground Ground
Slope Handling
Max Slope Angle 80
Orientation Orientation (Tran
State Walking
Crouching
Sliding
Wallrunning
Ground Check Distan 0.7
Num Raycasts 5
Slope Threshold 80
Sliding (Script)
Wall Running (Script)


Player
Static
Tag Player
Layer Default
Transform
Rigidbody
Player Movement Adva
Sliding (Script)
Wall Running (Script)
Script WallRunning
Wallrunning
What Is Wall Ground
What Is Ground Ground
Wall Run Force 200
Wall Climb Speed 3
Max Wall Run Time 1.5
Input
Upwards Run Key Left Shift
Downwards Run Key Left Control
Detection
Wall Check Distance 0.7
Min Jump Height 2
References
Orientation Orientation (T

Code

WallRunning.cs

```
using System.Collections;
using System.Collections.Generic;
using UnityEngine;

public class WallRunning : MonoBehaviour
{
    [Header("Wallrunning")]
    public LayerMask whatIsWall;
    public LayerMask whatIsGround;
    public float wallRunForce;
    public float wallClimbSpeed;
    public float maxWallRunTime;
    private float wallRunTimer;

    [Header("Input")]
    public KeyCode upwardsRunKey = KeyCode.LeftShift;
    public KeyCode downwardsRunKey = KeyCode.LeftControl;
    private bool upwardsRunning;
    private bool downwardsRunning;
    private float horizontalInput;
    private float verticalInput;

    [Header("Detection")]
    public float wallCheckDistance;
    public float minJumpHeight;
    private RaycastHit leftWallhit;
    private RaycastHit rightWallhit;
    private bool wallLeft;
    private bool wallRight;

    [Header("References")]
    public Transform orientation;
    private PlayerMovementAdvanced pm;
    private Rigidbody rb;

    private void Start()
```

```
    {
        rb = GetComponent<Rigidbody>();
        pm = GetComponent<PlayerMovementAdvanced>();
    }

    private void Update()
    {
        CheckForWall();
        StateMachine();
    }

    private void FixedUpdate()
    {
        if (pm.wallrunning)
            WallRunningMovement();
    }

    private void CheckForWall()
    {
        wallRight = Physics.Raycast(transform.position, orientation.right,
out rightWallhit, wallCheckDistance, whatIsWall);
        wallLeft = Physics.Raycast(transform.position, -orientation.right,
out leftWallhit, wallCheckDistance, whatIsWall);
    }

    private bool AboveGround()
    {
        return !Physics.Raycast(transform.position, Vector3.down,
minJumpHeight, whatIsGround);
    }

    private void StateMachine()
    {
        // Getting Inputs
        horizontalInput = Input.GetAxisRaw("Horizontal");
        verticalInput = Input.GetAxisRaw("Vertical");

        upwardsRunning = Input.GetKey(upwardsRunKey);
        downwardsRunning = Input.GetKey(downwardsRunKey);
```

```
        // State 1 - Wallrunning
        if((wallLeft || wallRight) && verticalInput > 0 && AboveGround())
        {
            if (!pm.wallrunning)
                StartWallRun();
        }

        // State 3 - None
        else
        {
            if (pm.wallrunning)
                StopWallRun();
        }
    }

    private void StartWallRun()
    {
        pm.wallrunning = true;
    }

    private void WallRunningMovement()
    {
        rb.useGravity = false;
        rb.velocity = new Vector3(rb.velocity.x, 0f, rb.velocity.z);

        Vector3 wallNormal = wallRight ? rightWallhit.normal :
leftWallhit.normal;

        Vector3 wallForward = Vector3.Cross(wallNormal, transform.up);

        if ((orientation.forward - wallForward).magnitude >
(orientation.forward - -wallForward).magnitude)
            wallForward = -wallForward;

        // forward force
        rb.AddForce(wallForward * wallRunForce, ForceMode.Force);

        // upwards/downwards force
        if (upwardsRunning)
```

```
            rb.velocity = new Vector3(rb.velocity.x, wallClimbSpeed,
rb.velocity.z);
        if (downwardsRunning)
            rb.velocity = new Vector3(rb.velocity.x, -wallClimbSpeed,
rb.velocity.z);

        // push to wall force
        if (!(wallLeft && horizontalInput > 0) && !(wallRight &&
horizontalInput < 0))
            rb.AddForce(-wallNormal * 100, ForceMode.Force);
    }

    private void StopWallRun()
    {
        pm.wallrunning = false;
    }
}
```

PlayerMovementAdvanced.cs

```
using System.Collections;
using System.Collections.Generic;
using UnityEngine;
using TMPro;

public class PlayerMovementAdvanced : MonoBehaviour
{
    [Header("Movement")]
    private float moveSpeed;
    public float groundDrag;
    public float walkSpeed;
    public float sprintSpeed;

    public float slideSpeed;
    private float desiredMoveSpeed;
    private float lastDesiredMoveSpeed;
    public float speedIncreaseMultiplier;
    public float slopeIncreaseMultiplier;

    public float wallrunSpeed; // new
```

```
    [Header("Jumping")]
    public float jumpForce;
    public float jumpCooldown;
    public float airMultiplier;
    bool readyToJump;

    [Header("Crouching")]
    public float crouchSpeed;
    public float crouchYScale;
    private float startYScale;

    [Header("Keybinds")]
    public KeyCode jumpKey = KeyCode.Space;
    public KeyCode sprintKey = KeyCode.LeftShift;
    public KeyCode crouchKey = KeyCode.LeftControl;

    [Header("Ground Check")]
    public float playerHeight;
    public LayerMask whatIsGround;
    bool grounded;

    [Header("Slope Handling")]
    public float maxSlopeAngle;
    private RaycastHit slopeHit;
    private bool exitingSlope;

    public Transform orientation;

    float horizontalInput;
    float verticalInput;

    Vector3 moveDirection;

    Rigidbody rb;

    public MovementState state;
    public enum MovementState
    {
        walking,
```

```
        sprinting,
        wallrunning, // new
        crouching,
        sliding,
        air
    }

    public bool crouching;
    public bool sliding;
    public bool wallrunning; // new

    // Parameters for ground check
    public float groundCheckDistance = 0.5f; // The distance to check for
ground
    public int numRaycasts = 5; // Number of raycasts to cast
    public float slopeThreshold = 30f; // The maximum slope angle that is
considered as walkable

    // Ground check variables
    //bool grounded;
    bool onSteepGround;

    private void Start()
    {
        rb = GetComponent<Rigidbody>();
        rb.freezeRotation = true;

        readyToJump = true;

        startYScale = transform.localScale.y;
    }

    private void Update()
    {
        // Perform ground check
        GroundCheck();
        // ground check
        //grounded = Physics.Raycast(transform.position, Vector3.down,
playerHeight * 0.5f + 0.2f, whatIsGround);
```

```
        MyInput();
        SpeedControl();
        StateHandler();

        // handle drag
        if (grounded)
            rb.drag = groundDrag;
        else
            rb.drag = 0;
    }

    private void FixedUpdate()
    {
        MovePlayer();
    }

    private void MyInput()
    {
        horizontalInput = Input.GetAxisRaw("Horizontal");
        verticalInput = Input.GetAxisRaw("Vertical");

        // when to jump
        if(Input.GetKeyUp(jumpKey) && !grounded){
            Debug.Log("Jumped, but not ground");
            Debug.Log("Jumped, onSteepGround is " + onSteepGround);
        }
        else if(Input.GetKey(jumpKey) && readyToJump && grounded)
        {
            readyToJump = false;
            //SDebug.Log("Jumped, on ground");
            Jump();

            Invoke(nameof(ResetJump), jumpCooldown);
        }

        // start crouch
        if (Input.GetKeyDown(crouchKey))
        {
            transform.localScale = new Vector3(transform.localScale.x,
crouchYScale, transform.localScale.z);
```

```
            rb.AddForce(Vector3.down * 5f, ForceMode.Impulse);
        }

        // stop crouch
        if (Input.GetKeyUp(crouchKey))
        {
            transform.localScale = new Vector3(transform.localScale.x,
startYScale, transform.localScale.z);
        }
    }

    private void StateHandler()
    {
        // Mode - Wallrunning
        if (wallrunning)
        {
            state = MovementState.wallrunning;
            desiredMoveSpeed = wallrunSpeed;
        }

        // Mode - Sliding
        if (sliding) // new
        {
            state = MovementState.sliding;

            if (OnSlope() && rb.velocity.y < 0.1f)
                desiredMoveSpeed = slideSpeed;

            else
                desiredMoveSpeed = sprintSpeed;
        }

        // Mode - Crouching
        else if (Input.GetKey(crouchKey)) // change to else if
        {
            state = MovementState.crouching;
            desiredMoveSpeed = crouchSpeed; // moveSpeed to
desiredMoveSpeed
        }
```

```
        // Mode - Sprinting
        else if(grounded && Input.GetKey(sprintKey))
        {
            state = MovementState.sprinting;
            desiredMoveSpeed = sprintSpeed; // moveSpeed to
desiredMoveSpeed
        }

        // Mode - Walking
        else if (grounded)
        {
            state = MovementState.walking;
            desiredMoveSpeed = walkSpeed;
        }

        // Mode - Air
        else
        {
            state = MovementState.air;
        }

        // check if desiredMoveSpeed has changed drastically
        if(Mathf.Abs(desiredMoveSpeed - lastDesiredMoveSpeed) > 4f &&
moveSpeed != 0)
        {
            StopAllCoroutines();
            StartCoroutine(SmoothlyLerpMoveSpeed());
        }
        else
        {
            moveSpeed = desiredMoveSpeed;
        }

        lastDesiredMoveSpeed = desiredMoveSpeed;
    }

    private IEnumerator SmoothlyLerpMoveSpeed()
    {
        // smoothly lerp movementSpeed to desired value
        float time = 0;
```

```
        float difference = Mathf.Abs(desiredMoveSpeed - moveSpeed);
        float startValue = moveSpeed;

        while (time < difference)
        {
            moveSpeed = Mathf.Lerp(startValue, desiredMoveSpeed, time / difference);

            if (OnSlope())
            {
                float slopeAngle = Vector3.Angle(Vector3.up, slopeHit.normal);
                float slopeAngleIncrease = 1 + (slopeAngle / 90f);

                time += Time.deltaTime * speedIncreaseMultiplier * slopeIncreaseMultiplier * slopeAngleIncrease;
            }
            else
                time += Time.deltaTime * speedIncreaseMultiplier;

            yield return null;
        }

        moveSpeed = desiredMoveSpeed;
    }

    private void MovePlayer()
    {
        // calculate movement direction
        moveDirection = orientation.forward * verticalInput + orientation.right * horizontalInput;

        // on slope
        if (OnSlope() && !exitingSlope)
        {
            rb.AddForce(GetSlopeMoveDirection(moveDirection) * moveSpeed * 20f, ForceMode.Force);

            // since we turn off the gravity on slope
```

```
            // if the player is moving upwards which means its y velocity
is greater than zero
            if (rb.velocity.y > 0)
            // we add a bit of downward force to keep the player
constantly on the slope
                rb.AddForce(Vector3.down * 80f, ForceMode.Force);
        }

        // on ground
        else if(grounded)
            rb.AddForce(moveDirection.normalized * moveSpeed * 10f,
ForceMode.Force);

        // in air
        else if(!grounded)
            rb.AddForce(moveDirection.normalized * moveSpeed * 10f *
airMultiplier, ForceMode.Force);

        // turn gravity off while on slope
        rb.useGravity = !OnSlope();
    }

    private void SpeedControl()
    {
        // limiting speed on slope
        if (OnSlope() && !exitingSlope)
        {
            if (rb.velocity.magnitude > moveSpeed)
                rb.velocity = rb.velocity.normalized * moveSpeed;
        }

        // limiting speed on ground or in air
        else
        {
            Vector3 flatVel = new Vector3(rb.velocity.x, 0f,
rb.velocity.z);

            // limit velocity if needed
            if (flatVel.magnitude > moveSpeed)
            {
```

```
                Vector3 limitedVel = flatVel.normalized * moveSpeed;
                rb.velocity = new Vector3(limitedVel.x, rb.velocity.y,
limitedVel.z);
            }
        }
    }

    private void Jump()
    {
        exitingSlope = true;

        // reset y velocity
        rb.velocity = new Vector3(rb.velocity.x, 0f, rb.velocity.z);

        rb.AddForce(transform.up * jumpForce, ForceMode.Impulse);
    }
    private void ResetJump()
    {
        readyToJump = true;

        exitingSlope = false;
    }

    public bool OnSlope()
    {
        if(Physics.Raycast(transform.position, Vector3.down, out slopeHit,
playerHeight * 0.5f + 0.3f))
        {
            // Calculate the angle between the player's direction and the
surface normal
            float angle = Vector3.Angle(Vector3.up, slopeHit.normal);

            // Determine if the angle is within the acceptable slope range
            return angle < maxSlopeAngle && angle != 0;
        }
        return false;
    }

    public Vector3 GetSlopeMoveDirection(Vector3 direction)
    {
```

```
        return Vector3.ProjectOnPlane(direction,
slopeHit.normal).normalized;
    }

    private void GroundCheck2()
    {
        grounded = false;
        onSteepGround = false;

        // Cast multiple rays downward from the player's position
        for (int i = 0; i < numRaycasts; i++)
        {
            float angle = i * (360f / numRaycasts); // Calculate angle for
raycast direction
            Vector3 direction = Quaternion.AngleAxis(angle, transform.up)
* -transform.forward; // Calculate raycast direction

            //groundCheckDistance = playerHeight * 0.5f + 0.2f;

            RaycastHit hit;
            if (Physics.Raycast(transform.position, Vector3.down, out hit,
playerHeight * 0.5f + 0.2f, whatIsGround))
            //if (Physics.Raycast(transform.position, direction, out hit,
groundCheckDistance, whatIsGround))
            {
                grounded = true;

                // Check if the slope angle exceeds the threshold
                float slopeAngle = Vector3.Angle(hit.normal, Vector3.up);
                if (slopeAngle > slopeThreshold)
                {
                    onSteepGround = true;
                    break; // Exit loop if a steep slope is detected
                }
            }
        }
    }

    private void GroundCheck() // work
    {
```

```
        // Cast a single raycast straight down from the player's position
        RaycastHit hit;
        if (Physics.Raycast(transform.position, Vector3.down, out hit,
playerHeight * 0.5f + 0.2f, whatIsGround))
        {
            grounded = true;

            // Check if the slope angle exceeds the threshold
            float slopeAngle = Vector3.Angle(hit.normal, Vector3.up);
            if (slopeAngle > maxSlopeAngle)
            {
                onSteepGround = true;
            }
            else
            {
                onSteepGround = false;
            }
        }
        else
        {
            grounded = false;
            onSteepGround = false;
        }
    }
}
```

WALL JUMPING & CAMERA EFFECTS - Unity Tutorial

https://www.youtube.com/watch?v=WfW0k5qENxM

Add wall jumping and a few other things while running on wall

Add wall jumping while running on wall

open up your wall running script
and add two floats for the wall jump up force
and wall jump side force

```
    [Header("Wallrunning")]
    public LayerMask whatIsWall;
    public LayerMask whatIsGround;
    public float wallRunForce;
    public float wallJumpUpForce;
    public float wallJumpSideForce;
    public float wallClimbSpeed;
    public float maxWallRunTime;
    private float wallRunTimer;
```

then you can create a new function called WallJump()
https://youtu.be/WfW0k5qENxM?si=Z8Ezd5soBNhZgAsW&t=21

```
    private void WallJump()
    {
        // enter exiting wall state
        exitingWall = true;
        exitWallTimer = exitWallTime;
// save the wallMormal depending on whether the wall is on the left or
right side
        Vector3 wallNormal = wallRight ? rightWallhit.normal :
leftWallhit.normal;
// calculate the force to apply
// by multiplying the upwards direction with the wallJumpForce
// and adding the wallNormal multiplied with the wallJumpSideForce
        Vector3 forceToApply = transform.up * wallJumpUpForce + wallNormal
* wallJumpSideForce;
// reset y velocity before add force
```

```
        // reset y velocity and add force
        rb.velocity = new Vector3(rb.velocity.x, 0f, rb.velocity.z);
// apply force
        rb.AddForce(forceToApply, ForceMode.Impulse);
    }
```

as with any jump i would recommend you
to reset the y velocity of the player before you add the force

this way the jumping will feel clean even if you're currently falling

also you need to call this function somewhere

so define a jump key

```
    [Header("Input")]
    public KeyCode jumpKey = KeyCode.Space;
```

and while you're in the wall running state just call the wall jump function if you press this key

```
    private void StateMachine()
    {
// TL;DR
        // State 1 - Wallrunning
        if((wallLeft || wallRight) && verticalInput > 0 && AboveGround()
&& !exitingWall)
        {
// TL;DR
            // wall jump
            if (Input.GetKeyDown(jumpKey)) WallJump(); // Here
        }
```

okay now you can switch back to unity
set the values of the variables you created and hit play
https://youtu.be/WfW0k5qENxM?si=XVWYHzuLPsIC5U1x&t=80

Problem:
Can’t exist from the wall while wall jumping

the reason for this is that
WallRun -1Frame- ***WallJump -1Frame***- **WallRun -1Frame-**
currently you can do a ***wall jump***
but then one frame later
if you're still close enough to a wall

You'll automatically enter the **wall running state** again

https://youtu.be/WfW0k5qENxM?si=wt6THvpmWhxOG49q&t=102
To fix this let's create an exiting wall state for this

you're going to need a bool called exiting
wall as well as 2 floats for the exit wall time and exit wall timer

```
    [Header("Exiting")]
    private bool exitingWall;
    public float exitWallTime;
    private float exitWallTimer;
```

now just as you created the other states
open the state machine add an elseif statement
and the condition is going to be the bool you just created

```
    private void StateMachine()
    {
        // Getting Inputs
// TL;DR
        // State 1 - Wallrunning
// Should not be able to start a wallrun while you're trying to exit the
wall
// will bool check !exitingWall
        if((wallLeft || wallRight) && verticalInput > 0 && AboveGround()
&& !exitingWall)
        {
            if (!pm.wallrunning){}
            // wallrun timer
            if (wallRunTimer > 0){}
            if(wallRunTimer <= 0 && pm.wallrunning){}

            // wall jump
            if (Input.GetKeyDown(jumpKey)) WallJump();
        }

        // State 2 - Exiting // Start from Here
        else if (exitingWall) //
        {
            if (pm.wallrunning)
                StopWallRun(); // to cancel any active wallrun
```

```
// only want to be in this state for short amount of time
// countdown exitWallTimer until it reach zero
            if (exitWallTimer > 0)
                exitWallTimer -= Time.deltaTime;
// as soon as it reach zero, set existingWall to false
            if (exitWallTimer <= 0)
                exitingWall = false;
        }

        // State 3 - None
        else
        {
            if (pm.wallrunning)
                StopWallRun();
        }
    }
```

ok and now you can go back to your WallJump function
and exit the wall by setting exiting wall to true and exit wall timer to exit wall time

```
    private void WallJump()
    {
        // enter exiting wall state
        exitingWall = true; // Here
        exitWallTimer = exitWallTime; // Here
// TL;DR
    }
```

https://youtu.be/WfW0k5qENxM?si=ZAAkcsTlEYcFdyzy&t=161
now back in unity set the exit wall time
2:45
to something like this 0.2 and there you go

Improve your wall run ability

https://youtu.be/WfW0k5qENxM?si=wPQ4HZ9TIpKwbLK4&t=178
some more things to improve your wall run ability
the first one would be **limiting your wall run time**

because right now it's a bit **weird** since you **can just wall run forever**
so let's implement that go back to the wall running script

And add floats for the max wall run time
And the wall run timer

```
    [Header("Wallrunning")]
    public LayerMask whatIsWall;
    public LayerMask whatIsGround;
    public float wallRunForce;
    public float wallJumpUpForce;
    public float wallJumpSideForce;
    public float wallClimbSpeed;
    public float maxWallRunTime; // Here
    private float wallRunTimer; // Here
```

now when you start the wall run
just set the wall run timer to the maximum

```
    private void StartWallRun()
    {
        pm.wallrunning = true;

        wallRunTimer = maxWallRunTime; // Here
    }
```

and while you're in the wall run state
make sure that the timer is counting down

```
    private void StateMachine()
    {
        // Getting Inputs
// TL;DR
        // State 1 - Wallrunning
        if((wallLeft || wallRight) && verticalInput > 0 && AboveGround()
&& !exitingWall)
        {
            if (!pm.wallrunning)
                StartWallRun();
// while you’re in the wall run state
// make sure that the timer is counting down
            // wallrun timer
            if (wallRunTimer > 0)
                wallRunTimer -= Time.deltaTime;
// whenever the timer reaches zero and you’re currently wall running,
// you want to set exitingWall to true,
```

```
// and start the exitWallTimer
            if(wallRunTimer <= 0 && pm.wallrunning)
            {
                exitingWall = true;
                exitWallTimer = exitWallTime;
            }
// TL;DR
    }
```

https://youtu.be/WfW0k5qENxM?si=uYX03Z2QSFlqWcaO&t=218
now if you go back to unity set the variables to something like this
MaxWallRunTIme 0.7
and hit play you can see that after a short time the wall run stops

how to use gravity when wall running

https://youtu.be/WfW0k5qENxM?si=0djzvFhxUJ_BDboy&t=227
so let's implement that
create a bool called use gravity and a float called gravity counterforce

```
    [Header("Gravity")]
    public bool useGravity;
    public float gravityCounterForce;
```

4:02
now whenever you set the rigidbody's gravity
don't just set it to false and instead
set it to use gravity

```
    private void WallRunningMovement()
    {
        rb.useGravity = useGravity; // Here
```

this way you can easily control in the inspector
whether or not you want to use it

also move this line up into the StartWallRun function

```
    private void StartWallRun()
    {
        pm.wallrunning = true;

        wallRunTimer = maxWallRunTime;
```

```
        rb.velocity = new Vector3(rb.velocity.x, 0f, rb.velocity.z); //
Here
```

because we don't want this to be called every frame

and also go back to your player movement script and make sure that
this line only gets executed
if you're not currently while running

```
    private void MovePlayer()
    {// TL;DR
        // turn gravity off while on slope
        if (!wallrunning) rb.useGravity = !OnSlope(); // Here
    }
```

https://youtu.be/WfW0k5qENxM?si=JUdHPrjl5ckxhWu0&t=268
if you turn it on and hit play it does work but it's a bit too strong

so to weaken the gravity a bit

go back to your wall running movement function
and if you are using gravity
apply a bit of counter force

```
    private void WallRunningMovement()
    { // TL;DR
        // push to wall force
        if (!(wallLeft && horizontalInput > 0) && !(wallRight &&
horizontalInput < 0))
            rb.AddForce(-wallNormal * 100, ForceMode.Force);

        // weaken gravity
        if (useGravity)  // Here
            rb.AddForce(transform.up * gravityCounterForce,
ForceMode.Force);
    }
```

https://youtu.be/WfW0k5qENxM?si=g4aDpulONh8mSt84&t=286
now the higher you set the counterforce
the lower the effect of gravity will be
just don't set it too high
unless you want to create a spaceship simulation

Fov changes and Camera Tilt

https://youtu.be/WfW0k5qENxM?si=-GJWyvTxZ_nDVoPK&t=297
Open up your PlayerCam script
whichever one you're using and
Create functions for the Fov changes and Tilting
also both functions should take in a float for the end value

```
    public void DoFov(float endValue){}
    public void DoTilt(float zTilt){}
```

Fade in and out Effect

https://youtu.be/WfW0k5qENxM?si=ZH8hFE5G13zAR2cf&t=313
use a great asset called DOTween
So import it to unity go through the setup steps
and then you can add using dg.tweening to your Cam script

```
using DG.Tweening;
```

now thanks to this asset the rest is super easy
just get the component of the camera
and use the DOFieldOfView function passing in the endValue and 0.25 for the transition time
and for the tilting you can use DOLocalRotate and then just pass in detailed on the z axis and again a transition time of 0.25

```
    public void DoFov(float endValue)
    {
        GetComponent<Camera>().DOFieldOfView(endValue, 0.25f);
    }

    public void DoTilt(float zTilt)
    {
        transform.DOLocalRotate(new Vector3(0, 0, zTilt), 0.25f);
    }
```

The `DoFov` method animates the camera's field of view change using DOTween's `DOFieldOfView` function. It smoothly transitions the camera's FOV to the specified `endValue` over a duration of 0.25 seconds.

The `DoTilt` method animates an object's tilt around its z-axis using DOTween's `DOLocalRotate` function. It smoothly rotates the object to the specified `zTilt` value around its local z-axis over a duration of 0.25 seconds.

and now one important change that you have to do is

to create a transform for the Cam holder

```
public Transform camHolder;
```

and then here you want to rotate the camHolder instead of the camera

```
private void Update()
    { // TL;DR
        // Rotate cam and orientation
        camHolder.rotation = Quaternion.Euler(xRotation, yRotation, 0);
```

otherwise you're rotating the camera from two points in the script and it would be overriding itself
https://youtu.be/WfW0k5qENxM?si=1v4fKKvvpOzK29md&t=372

and back in your WallRunning script
you can now get a reference to your camera script

```
    [Header("References")]
    public Transform orientation;
    public PlayerCam cam; // Here
    private PlayerMovementAdvanced pm;
    private Rigidbody rb;
```

and when you start the wall run
you can use the functions you just created to set the fov and tilt to
something like this

```
    private void StartWallRun()
    {
        pm.wallrunning = true;

        wallRunTimer = maxWallRunTime;

        rb.velocity = new Vector3(rb.velocity.x, 0f, rb.velocity.z);

        // apply camera effects
        cam.DoFov(90f); // Here
        if (wallLeft) cam.DoTilt(-5f); // Here
        if (wallRight) cam.DoTilt(5f); // Here
    }
```

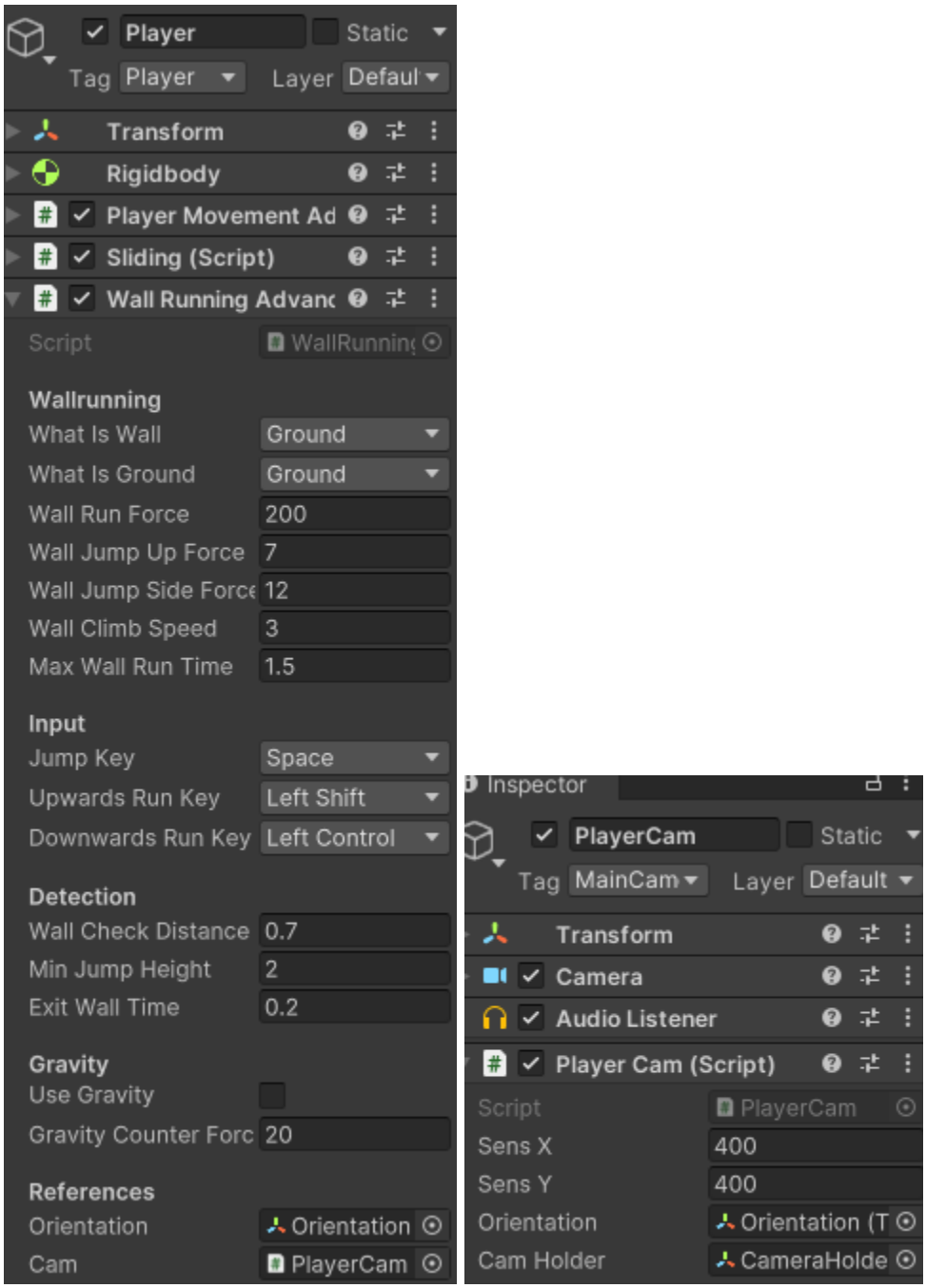
and don't forget to set them back to normal when you stop the wall run

```
    private void StopWallRun()
    {
        pm.wallrunning = false;
```

```
        // reset camera effects
        cam.DoFov(80f); // Here
        cam.DoTilt(0f); // Here
    }
```

https://youtu.be/WfW0k5qENxM?si=_-ko0p4-8ffV4wi4&t=405
now assign the cam holder to the camera script
and the camera to the wall running script

Value



Code

WallRunningAdvanced.cs

```
using System.Collections;
```

```
using System.Collections.Generic;
using UnityEngine;

public class WallRunningAdvanced : MonoBehaviour
{
    [Header("Wallrunning")]
    public LayerMask whatIsWall;
    public LayerMask whatIsGround;
    public float wallRunForce;
    public float wallJumpUpForce;
    public float wallJumpSideForce;
    public float wallClimbSpeed;
    public float maxWallRunTime;
    private float wallRunTimer;

    [Header("Input")]
    public KeyCode jumpKey = KeyCode.Space;
    public KeyCode upwardsRunKey = KeyCode.LeftShift;
    public KeyCode downwardsRunKey = KeyCode.LeftControl;
    private bool upwardsRunning;
    private bool downwardsRunning;
    private float horizontalInput;
    private float verticalInput;

    [Header("Detection")]
    public float wallCheckDistance;
    public float minJumpHeight;
    private RaycastHit leftWallhit;
    private RaycastHit rightWallhit;
    private bool wallLeft;
    private bool wallRight;

    [Header("Exiting")]
    private bool exitingWall;
    public float exitWallTime;
    private float exitWallTimer;

    [Header("Gravity")]
    public bool useGravity;
    public float gravityCounterForce;
```

```
    [Header("References")]
    public Transform orientation;
    public PlayerCam cam;
    private PlayerMovementAdvanced pm;
    private Rigidbody rb;

    private void Start()
    {
        rb = GetComponent<Rigidbody>();
        pm = GetComponent<PlayerMovementAdvanced>();
    }

    private void Update()
    {
        CheckForWall();
        StateMachine();
    }

    private void FixedUpdate()
    {
        if (pm.wallrunning)
            WallRunningMovement();
    }

    private void CheckForWall()
    {
        wallRight = Physics.Raycast(transform.position, orientation.right,
out rightWallhit, wallCheckDistance, whatIsWall);
        wallLeft = Physics.Raycast(transform.position, -orientation.right,
out leftWallhit, wallCheckDistance, whatIsWall);
    }

    private bool AboveGround()
    {
        return !Physics.Raycast(transform.position, Vector3.down,
minJumpHeight, whatIsGround);
    }

    private void StateMachine()
```

```
    {
        // Getting Inputs
        horizontalInput = Input.GetAxisRaw("Horizontal");
        verticalInput = Input.GetAxisRaw("Vertical");

        upwardsRunning = Input.GetKey(upwardsRunKey);
        downwardsRunning = Input.GetKey(downwardsRunKey);

        // State 1 - Wallrunning
        if((wallLeft || wallRight) && verticalInput > 0 && AboveGround()
&& !exitingWall)
        {
            if (!pm.wallrunning)
                StartWallRun();

            // wallrun timer
            if (wallRunTimer > 0)
                wallRunTimer -= Time.deltaTime;

            if(wallRunTimer <= 0 && pm.wallrunning)
            {
                exitingWall = true;
                exitWallTimer = exitWallTime;
            }

            // wall jump
            if (Input.GetKeyDown(jumpKey)) WallJump();
        }

        // State 2 - Exiting
        else if (exitingWall)
        {
            if (pm.wallrunning)
                StopWallRun();

            if (exitWallTimer > 0)
                exitWallTimer -= Time.deltaTime;

            if (exitWallTimer <= 0)
                exitingWall = false;
```

```
        }

        // State 3 - None
        else
        {
            if (pm.wallrunning)
                StopWallRun();
        }
    }

    private void StartWallRun()
    {
        pm.wallrunning = true;

        wallRunTimer = maxWallRunTime;

        rb.velocity = new Vector3(rb.velocity.x, 0f, rb.velocity.z);

        // apply camera effects
        cam.DoFov(90f);
        if (wallLeft) cam.DoTilt(-5f);
        if (wallRight) cam.DoTilt(5f);
    }

    private void WallRunningMovement()
    {
        rb.useGravity = useGravity;

        Vector3 wallNormal = wallRight ? rightWallhit.normal :
leftWallhit.normal;

        Vector3 wallForward = Vector3.Cross(wallNormal, transform.up);

        if ((orientation.forward - wallForward).magnitude >
(orientation.forward - -wallForward).magnitude)
            wallForward = -wallForward;

        // forward force
        rb.AddForce(wallForward * wallRunForce, ForceMode.Force);
```

```
        // upwards/downwards force
        if (upwardsRunning)
            rb.velocity = new Vector3(rb.velocity.x, wallClimbSpeed,
rb.velocity.z);
        if (downwardsRunning)
            rb.velocity = new Vector3(rb.velocity.x, -wallClimbSpeed,
rb.velocity.z);

        // push to wall force
        if (!(wallLeft && horizontalInput > 0) && !(wallRight &&
horizontalInput < 0))
            rb.AddForce(-wallNormal * 100, ForceMode.Force);

        // weaken gravity
        if (useGravity)
            rb.AddForce(transform.up * gravityCounterForce,
ForceMode.Force);
    }

    private void StopWallRun()
    {
        pm.wallrunning = false;

        // reset camera effects
        cam.DoFov(80f);
        cam.DoTilt(0f);
    }

    private void WallJump()
    {
        // enter exiting wall state
        exitingWall = true;
        exitWallTimer = exitWallTime;

        Vector3 wallNormal = wallRight ? rightWallhit.normal :
leftWallhit.normal;

        Vector3 forceToApply = transform.up * wallJumpUpForce + wallNormal
* wallJumpSideForce;
```

```
        // reset y velocity and add force
        rb.velocity = new Vector3(rb.velocity.x, 0f, rb.velocity.z);
        rb.AddForce(forceToApply, ForceMode.Impulse);
    }
}
```

PlayerCam.cs

```
using System.Collections;
using System.Collections.Generic;
using UnityEngine;
using DG.Tweening;

public class PlayerCam : MonoBehaviour
{
    public float sensX;
    public float sensY;

    public Transform orientation;
    public Transform camHolder;

    float xRotation;
    float yRotation;

    private void Start()
    {
        Cursor.lockState = CursorLockMode.Locked;
        Cursor.visible = false;
    }

    private void Update()
    {
        // get mouse input
        float mouseX = Input.GetAxisRaw("Mouse X") * Time.deltaTime *
sensX;
        float mouseY = Input.GetAxisRaw("Mouse Y") * Time.deltaTime *
sensY;

        yRotation += mouseX;
```

```
        xRotation -= mouseY;
        xRotation = Mathf.Clamp(xRotation, -90f, 90f);

        // rotate cam and orientation
        camHolder.rotation = Quaternion.Euler(xRotation, yRotation, 0);
        orientation.rotation = Quaternion.Euler(0, yRotation, 0);
    }

    public void DoFov(float endValue)
    {
        GetComponent<Camera>().DOFieldOfView(endValue, 0.25f);
    }

    public void DoTilt(float zTilt)
    {
        transform.DOLocalRotate(new Vector3(0, 0, zTilt), 0.25f);
    }
}
```

Full CLIMBING SYSTEM in 10 MINUTES - Unity Tutorial

https://www.youtube.com/watch?v=tAJLiOEfbQg

To know about climbing and climb jumping as a base

The code work for first person movement script and third person controller

to have a great climbing ability
that can easily be combined with wall running
can also vault over objects which is quite cool

Climbing.cs
first we're going to define some variables
you're going to need a reference
for the orientation which is just an empty game object that stores where the player is looking
the rigid body
and the layer mask to define whatIsWall

```
    [Header("References")]
    public Transform orientation;
    public Rigidbody rb;
    public PlayerMovementAdvanced pm;
    public LayerMask whatIsWall;
```

now you also want floats
for the climbSpeed, maxClimbTime and climbTimer
as well as a bool to check if you're currently climbing

```
    [Header("Climbing")]
    public float climbSpeed;
    public float maxClimbTime;
    private float climbTimer;

    private bool climbing;
```

for the wall detection
you're going to need floats

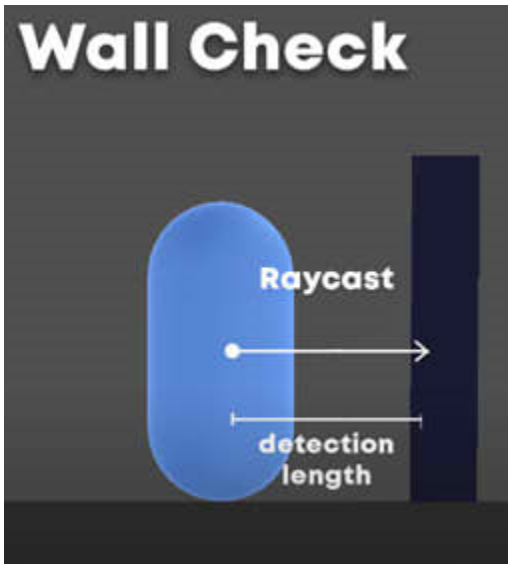
for the detection length, the sphere cast radius, the max wall look angle, and the current wall look angle
also a raycast hit variable to store the information of the front wall head
and a bool to check if there's a wall in front of you

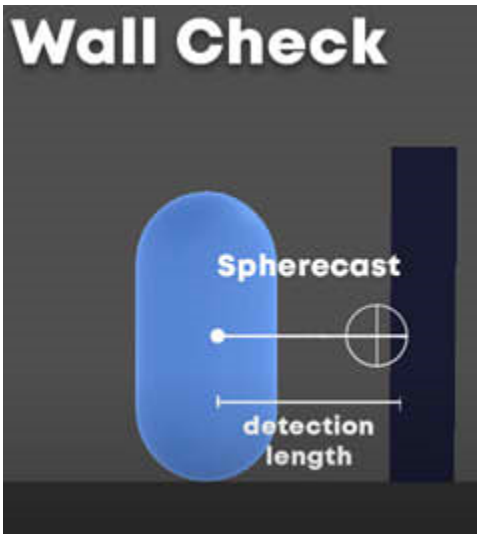
```
    [Header("Detection")]
    public float detectionLength;
    public float sphereCastRadius;
    public float maxWallLookAngle;
    private float wallLookAngle;

    private RaycastHit frontWallHit;
    private bool wallFront;
```

okay and now let's actually implement this wall detection
https://youtu.be/tAJLiOEfbQg?si=eGuiuGau4ONiD1OT&t=93

Sphere Cast for Wall Check

for this we're going to use a sphere cast
which is exactly the same as a raycast
but instead of checking with an invisible line
it's kind of like a cylinder





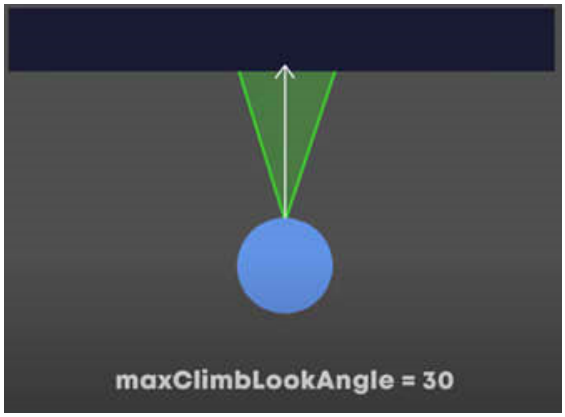
Raycast vs Spherecast
Raycasts in Unity **project a straight line** from a designated origin point towards a specified direction. They **identify collisions along this line until encountering a collider or reaching the set maximum distance**. Raycasts excel at pinpointing collisions with narrow objects or specific locations in space.

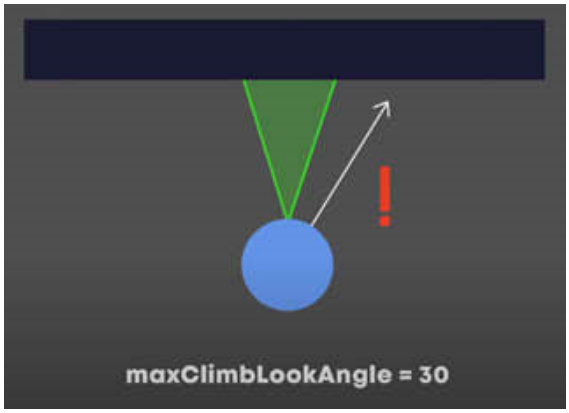
Conversely, **Spherecasts project a sphere along a given direction, detecting collisions with any intersecting or touching colliders within the sphere's volume**. Spherecasts are advantageous for detecting collisions with broader objects or for emulating the volume of an entity.

so you can just use physics.spherecast
and then pass in the starting position, radius, direction where the information is going to be stored length of the sphere cast and layer mask

```
    private void WallCheck()
    {
        wallFront = Physics.SphereCast(transform.position,
sphereCastRadius, orientation.forward, out frontWallHit,
detectionLength, whatIsWall);
```

and now for the wall look angle we're going to code it in a way
that if the max climbed look angle is for example 30
you need to look at the wall in this area
in order to start climbing





if you look at the wall in an angle of something like 45 degrees
it's not going to work

and this is really important
because if you don't implement this
you would be able to well run and climb at the same time which doesn't make any sense

```
    private void WallCheck()
    {
        wallFront = Physics.SphereCast(transform.position,
sphereCastRadius, orientation.forward, out frontWallHit, detectionLength,
whatIsWall);
        wallLookAngle = Vector3.Angle(orientation.forward,
-frontWallHit.normal); // Here
    }
```

okay now just call this function in void update
and you're ready to code the climbing movement

```
    private void Update()
    {
        WallCheck();
    }
```

for this create three new functions
for starting a climb, climbing and stopping a climb

```
    private void StartClimbing(){}
    private void ClimbingMovement(){}
    private void StopClimbing(){}
```

in start climbing
just set the climbing bool to true
and in stop climbing set it to false

```
    private void StartClimbing()
    {
        climbing = true;
        pm.climbing = true;
    }
    private void StopClimbing()
    {
        climbing = false;
        pm.climbing = false;
    }
```

for the climbing movement
the easiest way of coding this
is to just set the y velocity of the player's rigid body to your climb speed
while leaving the x and z velocities as they are

```
    private void ClimbingMovement()
    {
        rb.velocity = new Vector3(rb.velocity.x, climbSpeed,
rb.velocity.z);
    }
```

now **usually** when you code player movement
you want to use **rigidbody.addForce**
because it's a lot smoother

but for climbing directly setting the velocity works just fine

can add more functionality to them if you want to
for example
you could change the camera Fov when you start climbing
then play a sound while you're climbing
and then a particle effect when the timer ran out
and you can no longer climb
so this is generally a very clean way of structuring your code

now of course you need to call these functions somewhere
https://youtu.be/tAJLiOEfbQg?si=UPDhgZdjL_zquMn8&t=213
so create a state machine and here we're going
to define when to start or stop climbing

```
    private void StateMachine()
    {
        // State 1 - Climbing
```

so to enter the climbing state
there needs to be a wall in front of the player
you need to be pressing the forward key
and as explained the wall look angle needs to be below the max wall look angle

```
        if (wallFront && Input.GetKey(KeyCode.W) && wallLookAngle <
maxWallLookAngle && !exitingWall)
        {
```

now if you're not climbing
and you still have climb time left called the start climbing function

```
            if (!climbing && climbTimer > 0) StartClimbing();
```

and to implement the timer just count it down when it's above zero
and stop climbing when it's below zero

```
            // timer
            if (climbTimer > 0) climbTimer -= Time.deltaTime;
            if (climbTimer < 0) StopClimbing();
        }

        // State 2 - Exiting
        else if (exitingWall)
        {
            if (climbing) StopClimbing();

            if (exitWallTimer > 0) exitWallTimer -= Time.deltaTime;
```

```
            if (exitWallTimer < 0) exitingWall = false;
        }
```

and if you're not in the climbing state
you want to stop any active climbs

```
        // State 3 - None
        else
        {
            if (climbing) StopClimbing();
        }

        if (wallFront && Input.GetKeyDown(jumpKey) && climbJumpsLeft > 0)
ClimbJump();
    }
```

now you might have noticed that
The climb timer never gets a reset
https://youtu.be/tAJLiOEfbQg?si=XvAR4rlYJC_z3fFv&t=254
so for this go to your player movement script
and make sure that the grounded bool is set to public

```
   [Header("Ground Check")]
    public float playerHeight;
    public LayerMask whatIsGround;
    public bool grounded;
```

now you can reference this player movement script from your climbing script

```
    [Header("References")]
    public PlayerMovementAdvanced pm;
```

and then inside of the wall check function
just reset the climb timer if you're grounded

```
    private void WallCheck()
    {
// TL;DR
        if ((wallFront && newWall) || pm.grounded)
        {
            climbTimer = maxClimbTime;
            climbJumpsLeft = climbJumps;
        }
    }
```

also don't forget to call the state machine and climbing movement function in void update

```
    private void Update()
    {
        WallCheck();
        StateMachine();
        if (climbing && !exitingWall) ClimbingMovement();
    }
```

okay and that's it for the climbing part
https://youtu.be/tAJLiOEfbQg?si=t2GBvmvKA24ceARM&t=283

head over to unity and
set the variables to something like this

the only problem that's left is that
currently you can move left and right really fast while climbing
if you like that then just leave it as it is
https://youtu.be/tAJLiOEfbQg?si=0JX6W5KtPMEScYem&t=319

how to change left and right move speed while climbing

open up your player movement script
create a float for the climb speed

```
    [Header("Movement")]
    private float moveSpeed;
    public float groundDrag;
    public float walkSpeed;
    public float sprintSpeed;
    public float wallrunSpeed;
    public float climbSpeed; // new
```

define a new state called climbing

```
    public enum MovementState
    {
        walking,
        sprinting,
        wallrunning,
        climbing, // new
        crouching,
        sliding,
```

```
        air
    }
```

and also create a bool with the same name

```
    public bool crouching;
    public bool sliding;
    public bool wallrunning;
    public bool climbing; // new
```

and now inside of the state machine
create a new state for climbing

```
    private void StateHandler()
    {
        // Mode - Climbing
        if (climbing)
        {
```

and in there just set the state to climbing
and then the desired move speed to your climb speed

```
            state = MovementState.climbing;
             desiredMoveSpeed = climbSpeed;
        }

        // Mode - Wallrunning
        else if (wallrunning)
// TL;DR
    }
```

and in your climbing script
make sure to activate the climbing bool of the player movement script
just as you did with the private climbing bool

```
    private void StartClimbing()
    {
        climbing = true;
        pm.climbing = true; // Here
    }
```

```
    private void StopClimbing()
    {
        climbing = false;
```

```
        pm.climbing = false; // Here
    }
```

so back in unity
https://youtu.be/tAJLiOEfbQg?si=Fl_QGzrH39PjtZ5W&t=363
you can set the climb speed to a lower value
and now you can move left or right
but only slightly which is definitely more realistic

Climb Jump

okay now let's go back to the script and code the climb jump
for this you're first going to need a few more variables

so create floats for the climb jump up
and climb jump back force
then a keycode for the jump key i'm going to use space
and also create two integers for the climbed jumps and climb jumps left

```
    [Header("ClimbJumping")]
    public float climbJumpUpForce;
    public float climbJumpBackForce;

    public KeyCode jumpKey = KeyCode.Space;
    public int climbJumps;
    private int climbJumpsLeft;
```

next
create a transform for the last wall
a vector3 for the last wall normal
and a float for the minimum amount that a wall normal needs to change

```
    private Transform lastWall;
    private Vector3 lastWallNormal;
    public float minWallNormalAngleChange;
```

now you can create a new function called climb jump

```
    private void ClimbJump()
    {
        exitingWall = true;
        exitWallTimer = exitWallTime;
```

in there calculate the force that you want to apply by multiplying
the up direction with the upwards jump force and the direction away from the wall with the backwards jump force

```
        Vector3 forceToApply = transform.up * climbJumpUpForce +
frontWallHit.normal * climbJumpBackForce;
```

also before you add the force
It's usually a good idea to reset the rigidbody's y velocity to zero

```
        rb.velocity = new Vector3(rb.velocity.x, 0f, rb.velocity.z);
```

Then you simply add this force by using
rigidbody.addforce and forcemode.impulse

```
        rb.AddForce(forceToApply, ForceMode.Impulse);
```

and don't forget to count down the climb jumps after you jump

```
        climbJumpsLeft--;
    }
```

https://youtu.be/tAJLiOEfbQg?si=smZZDAt4jnBGyYfO&t=436
now in the state machine
you want to call this climb jump function
if there's a wall in the front
you're pressing the jump key
and you still have climb jumps left

```
    private void StateMachine()
    {   TL;DR
```

if there's a wall in the front
you're pressing the jump key
and you still have climb jumps left

```
        if (wallFront && Input.GetKeyDown(jumpKey) && climbJumpsLeft > 0)
ClimbJump();
    }
```

Checking if we hit a new wall while Climbing

https://youtu.be/tAJLiOEfbQg?si=j0eh2UWNrFbngYxB&t=446
now the next thing we need to code is
checking whether or not we hit a new wall

because in that case we want to reset our climb jumps

so first make sure that you store the transform of the current wall
and also the normal of it
also if you didn't know the normal in this case

is just a direction pointing away from the wall

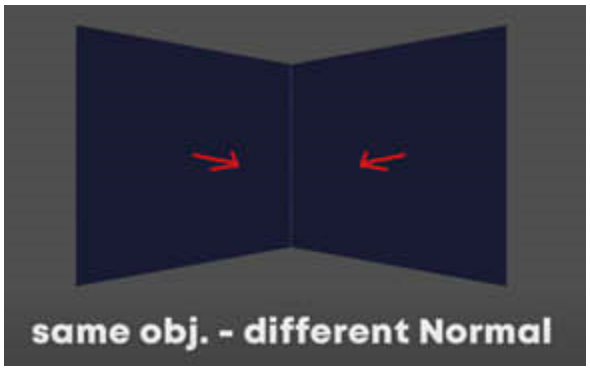
```
    private void StartClimbing()
    {
        climbing = true;
        pm.climbing = true;

        lastWall = frontWallHit.transform; // Here
        lastWallNormal = frontWallHit.normal; // Here
    }
```

so back in the wall check function let's
create a bool called newWall

```
    private void WallCheck()
    { // TL;DR
        bool newWall =
```

https://youtu.be/tAJLiOEfbQg?si=1OZF8VNbBQUXfapg&t=472
now when did you hit a new wall
there's basically two cases

either when the wall you hit has a completely different transform from the last one
or if the normal of the wall has changed



and here we just compare the angle between the current wall normal and the last one

```
        bool newWall = frontWallHit.transform != lastWall ||
Mathf.Abs(Vector3.Angle(lastWallNormal, frontWallHit.normal)) >
minWallNormalAngleChange;
```
ok and now if there's a wall in front
and you hit a new wall or if you're grounded
```
        if ((wallFront && newWall) || pm.grounded)
        {
```
you want to reset the climb timer and climb jumps left
```
            climbTimer = maxClimbTime;
            climbJumpsLeft = climbJumps;
        }
    }
```

https://youtu.be/tAJLiOEfbQg?si=9CHM858bsJnUJYPe&t=501
now you can head back to unity and set the variables to something like this
and if you hit play you can now perform climb jumps

there's just one problem
if you hold the forward key while jumping you're kind of countering the jump backward force
to fix that you can open your script again
and create a bool called exiting wall as well as floats for the exit wall time and exit wall timer
```
    [Header("Exiting")]
    public bool exitingWall;
    public float exitWallTime;
    private float exitWallTimer;
```

now in the state machine you can make an entirely new state
```
    private void StateMachine()
    {
        // State 1 - Climbing
// TL;DR
        // State 2 - Exiting
```
that gets activated when exiting wall is true
```
        else if (exitingWall)
        {
```
and in there you first want to stop any active climbs
```
            if (climbing) StopClimbing();
```
and also implement the exit wall timer
similar to how we implemented the climb timer
```
            if (exitWallTimer > 0) exitWallTimer -= Time.deltaTime;
            if (exitWallTimer < 0) exitingWall = false;
```

```
        }

        // State 3 - None
    }
```

```
    private void ClimbJump()
    {
```

and whenever you jump just set existing wall to true
and start the timer

```
        exitingWall = true;
        exitWallTimer = exitWallTime;
```

```
    private void Update()
    {
        WallCheck();
        StateMachine();
```

and don't forget to make sure that you can't climb while exiting a wall

```
        if (climbing && !exitingWall) ClimbingMovement();
    }
```

and now in your player movement script
get a reference to your climbing script

```
    [Header("References")]
    public Climbing climbingScript;
```

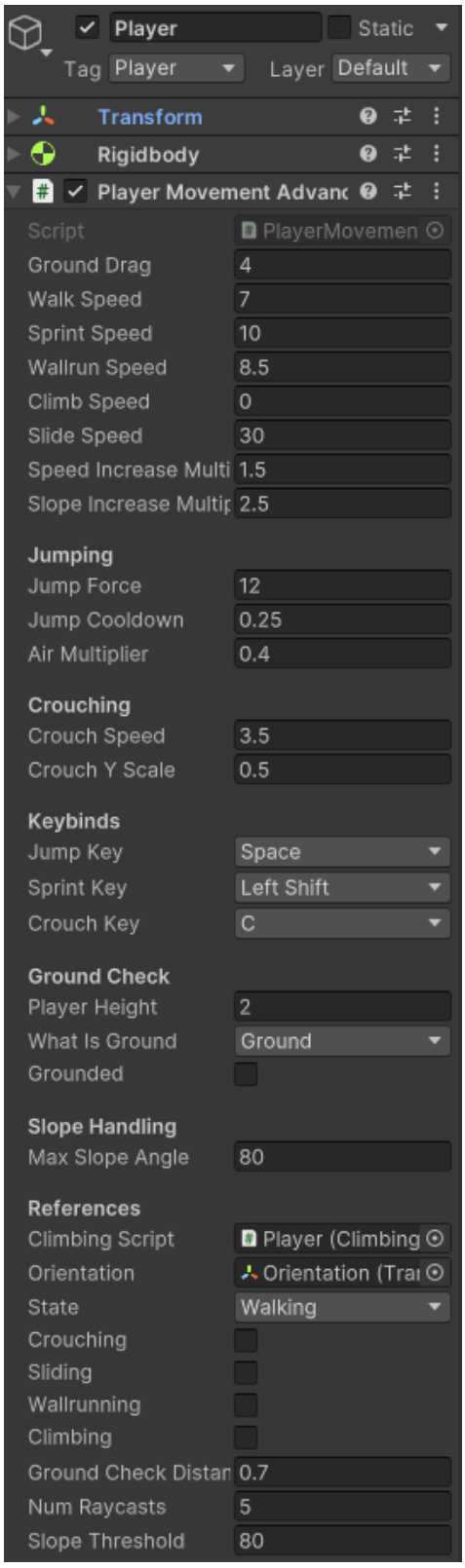
and then you want to stop the entire move player function
while you're exiting a wall

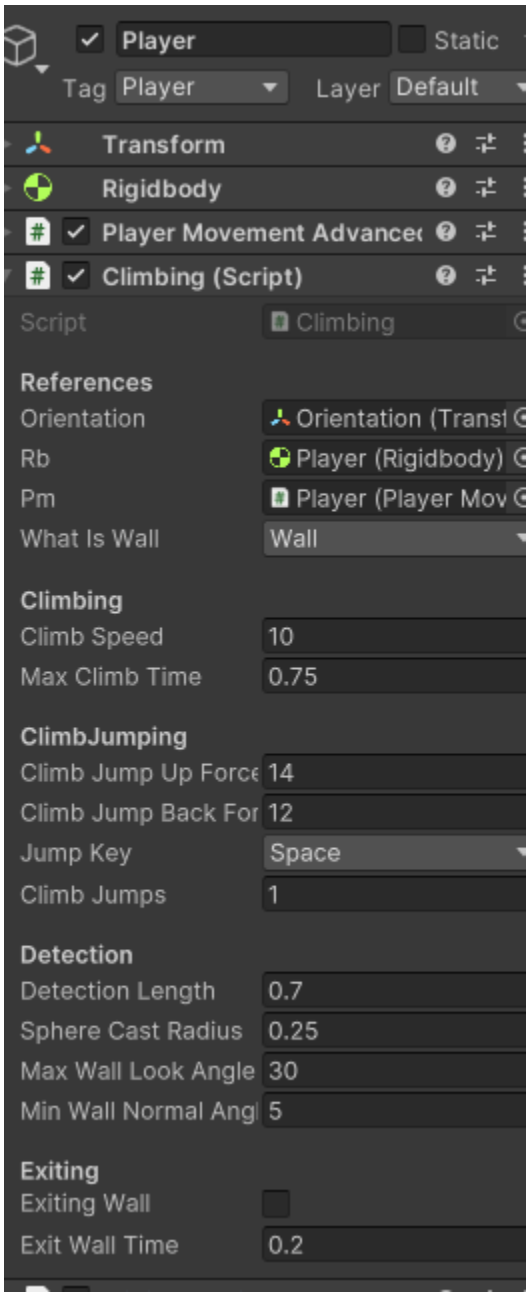
```
    private void MovePlayer()
    {
        if (climbingScript.exitingWall) return;
```

that means while exiting a wall pressing the forward key has no effect

back in unity assign the climbing script to your player movement script
set the exit wall time to something like this and hit play
and there you go you have successfully

Value


Player
Static
Tag Player
Layer Default
Transform
Rigidbody
Player Movement Advanc
Script PlayerMovemen
Ground Drag 4
Walk Speed 7
Sprint Speed 10
Wallrun Speed 8.5
Climb Speed 0
Slide Speed 30
Speed Increase Multi 1.5
Slope Increase Multip 2.5
Jumping
Jump Force 12
Jump Cooldown 0.25
Air Multiplier 0.4
Crouching
Crouch Speed 3.5
Crouch Y Scale 0.5
Keybinds
Jump Key Space
Sprint Key Left Shift
Crouch Key C
Ground Check
Player Height 2
What Is Ground Ground
Grounded
Slope Handling
Max Slope Angle 80
References
Climbing Script Player (Climbing
Orientation Orientation (Trai
State Walking
Crouching
Sliding
Wallrunning
Climbing
Ground Check Distan 0.7
Num Raycasts 5
Slope Threshold 80


Player
Static
Tag Player
Layer Default
Transform
Rigidbody
Player Movement Advance
Climbing (Script)
Script Climbing
References
Orientation Orientation (Transf
Rb Player (Rigidbody)
Pm Player (Player Mov
What Is Wall Wall
Climbing
Climb Speed 10
Max Climb Time 0.75
ClimbJumping
Climb Jump Up Force 14
Climb Jump Back For 12
Jump Key Space
Climb Jumps 1
Detection
Detection Length 0.7
Sphere Cast Radius 0.25
Max Wall Look Angle 30
Min Wall Normal Angl 5
Exiting
Exiting Wall
Exit Wall Time 0.2

Code

Climbing.cs

```
using System.Collections;
using System.Collections.Generic;
using UnityEngine;

public class Climbing : MonoBehaviour
{
    [Header("References")]
    public Transform orientation;
    public Rigidbody rb;
    public PlayerMovementAdvanced pm;
    public LayerMask whatIsWall;

    [Header("Climbing")]
    public float climbSpeed;
    public float maxClimbTime;
    private float climbTimer;

    private bool climbing;

    [Header("ClimbJumping")]
    public float climbJumpUpForce;
    public float climbJumpBackForce;

    public KeyCode jumpKey = KeyCode.Space;
    public int climbJumps;
    private int climbJumpsLeft;

    [Header("Detection")]
    public float detectionLength;
    public float sphereCastRadius;
    public float maxWallLookAngle;
    private float wallLookAngle;

    private RaycastHit frontWallHit;
    private bool wallFront;
```

```
    private Transform lastWall;
    private Vector3 lastWallNormal;
    public float minWallNormalAngleChange;

    [Header("Exiting")]
    public bool exitingWall;
    public float exitWallTime;
    private float exitWallTimer;

    private void Update()
    {
        WallCheck();
        StateMachine();

        if (climbing && !exitingWall) ClimbingMovement();
    }

    private void StateMachine()
    {
        // State 1 - Climbing
        if (wallFront && Input.GetKey(KeyCode.W) && wallLookAngle <
maxWallLookAngle && !exitingWall)
        {
            if (!climbing && climbTimer > 0) StartClimbing();

            // timer
            if (climbTimer > 0) climbTimer -= Time.deltaTime;
            if (climbTimer < 0) StopClimbing();
        }

        // State 2 - Exiting
        else if (exitingWall)
        {
            if (climbing) StopClimbing();

            if (exitWallTimer > 0) exitWallTimer -= Time.deltaTime;
            if (exitWallTimer < 0) exitingWall = false;
        }

        // State 3 - None
```

```
        else
        {
            if (climbing) StopClimbing();
        }

        if (wallFront && Input.GetKeyDown(jumpKey) && climbJumpsLeft > 0)
ClimbJump();
    }

    private void WallCheck()
    {
        wallFront = Physics.SphereCast(transform.position,
sphereCastRadius, orientation.forward, out frontWallHit, detectionLength,
whatIsWall);
        wallLookAngle = Vector3.Angle(orientation.forward,
-frontWallHit.normal);

        bool newWall = frontWallHit.transform != lastWall ||
Mathf.Abs(Vector3.Angle(lastWallNormal, frontWallHit.normal)) >
minWallNormalAngleChange;

        if ((wallFront && newWall) || pm.grounded)
        {
            climbTimer = maxClimbTime;
            climbJumpsLeft = climbJumps;
        }
    }

    private void StartClimbing()
    {
        climbing = true;
        pm.climbing = true;

        lastWall = frontWallHit.transform;
        lastWallNormal = frontWallHit.normal;

        /// idea - camera fov change
    }

    private void ClimbingMovement()
```

```
    {
        rb.velocity = new Vector3(rb.velocity.x, climbSpeed,
rb.velocity.z);

        /// idea - sound effect
    }

    private void StopClimbing()
    {
        climbing = false;
        pm.climbing = false;

        /// idea - particle effect
        /// idea - sound effect
    }

    private void ClimbJump()
    {
        exitingWall = true;
        exitWallTimer = exitWallTime;

        Vector3 forceToApply = transform.up * climbJumpUpForce +
frontWallHit.normal * climbJumpBackForce;

        rb.velocity = new Vector3(rb.velocity.x, 0f, rb.velocity.z);
        rb.AddForce(forceToApply, ForceMode.Impulse);

        climbJumpsLeft--;
    }
}
```

PlayerMovementAdvanced.cs

```
using System.Collections;
using System.Collections.Generic;
using UnityEngine;
using TMPro;

public class PlayerMovementAdvanced : MonoBehaviour
```

```
{
    [Header("Movement")]
    private float moveSpeed;
    public float groundDrag;
    public float walkSpeed;
    public float sprintSpeed;
    public float wallrunSpeed;
    public float climbSpeed; // new
    public float slideSpeed;
    private float desiredMoveSpeed;
    private float lastDesiredMoveSpeed;

    public float speedIncreaseMultiplier;
    public float slopeIncreaseMultiplier;

    [Header("Jumping")]
    public float jumpForce;
    public float jumpCooldown;
    public float airMultiplier;
    bool readyToJump;

    [Header("Crouching")]
    public float crouchSpeed;
    public float crouchYScale;
    private float startYScale;

    [Header("Keybinds")]
    public KeyCode jumpKey = KeyCode.Space;
    public KeyCode sprintKey = KeyCode.LeftShift;
    public KeyCode crouchKey = KeyCode.LeftControl;

    [Header("Ground Check")]
    public float playerHeight;
    public LayerMask whatIsGround;
    public bool grounded;

    [Header("Slope Handling")]
    public float maxSlopeAngle;
    private RaycastHit slopeHit;
    private bool exitingSlope;
```

```
    [Header("References")]
    public Climbing climbingScript;

    public Transform orientation;

    float horizontalInput;
    float verticalInput;

    Vector3 moveDirection;

    Rigidbody rb;

    public MovementState state;
    public enum MovementState
    {
        walking,
        sprinting,
        wallrunning,
        climbing, // new
        crouching,
        sliding,
        air
    }

    public bool crouching;
    public bool sliding;
    public bool wallrunning;
    public bool climbing; // new

    // Parameters for ground check
    public float groundCheckDistance = 0.5f; // The distance to check for
ground
    public int numRaycasts = 5; // Number of raycasts to cast
    public float slopeThreshold = 30f; // The maximum slope angle that is
considered as walkable

    // Ground check variables
    //bool grounded;
    bool onSteepGround;
```

```
    private void Start()
    {
        rb = GetComponent<Rigidbody>();
        rb.freezeRotation = true;

        readyToJump = true;

        startYScale = transform.localScale.y;
    }

    private void Update()
    {
        // Perform ground check
        GroundCheck();
        // ground check
        //grounded = Physics.Raycast(transform.position, Vector3.down,
playerHeight * 0.5f + 0.2f, whatIsGround);

        MyInput();
        SpeedControl();
        StateHandler();

        // handle drag
        if (grounded)
            rb.drag = groundDrag;
        else
            rb.drag = 0;
    }

    private void FixedUpdate()
    {
        MovePlayer();
    }

    private void MyInput()
    {
        horizontalInput = Input.GetAxisRaw("Horizontal");
        verticalInput = Input.GetAxisRaw("Vertical");
```

```
        // when to jump
        if(Input.GetKeyUp(jumpKey) && !grounded){
            Debug.Log("Jumped, but not ground");
            Debug.Log("Jumped, onSteepGround is " + onSteepGround);
        }
        else if(Input.GetKey(jumpKey) && readyToJump && grounded)
        {
            readyToJump = false;
            //SDebug.Log("Jumped, on ground");
            Jump();

            Invoke(nameof(ResetJump), jumpCooldown);
        }

        // start crouch
        if (Input.GetKeyDown(crouchKey))
        {
            crouching = true;
            transform.localScale = new Vector3(transform.localScale.x,
crouchYScale, transform.localScale.z);
            rb.AddForce(Vector3.down * 5f, ForceMode.Impulse);
        }

        // stop crouch
        if (Input.GetKeyUp(crouchKey))
        {
            crouching = false;
            transform.localScale = new Vector3(transform.localScale.x,
startYScale, transform.localScale.z);
        }
    }

    private void StateHandler()
    {
        // Mode - Climbing
        if (climbing) // New
        {
            state = MovementState.climbing;
            desiredMoveSpeed = climbSpeed;
        }
```

```
        // Mode - Wallrunning
        else if (wallrunning)
        {
            state = MovementState.wallrunning;
            desiredMoveSpeed = wallrunSpeed;
        }

        // Mode - Sliding
        if (sliding)
        {
            state = MovementState.sliding;

            if (OnSlope() && rb.velocity.y < 0.1f)
                desiredMoveSpeed = slideSpeed;

            else
                desiredMoveSpeed = sprintSpeed;
        }

        // Mode - Crouching
        else if (Input.GetKey(crouchKey))
        {
            state = MovementState.crouching;
            desiredMoveSpeed = crouchSpeed; // moveSpeed to
desiredMoveSpeed
        }

        // Mode - Sprinting
        else if(grounded && Input.GetKey(sprintKey))
        {
            state = MovementState.sprinting;
            desiredMoveSpeed = sprintSpeed; // moveSpeed to
desiredMoveSpeed
        }

        // Mode - Walking
        else if (grounded)
        {
            state = MovementState.walking;
```

```
            desiredMoveSpeed = walkSpeed;
        }

        // Mode - Air
        else
        {
            state = MovementState.air;
        }

        // check if desiredMoveSpeed has changed drastically
        if(Mathf.Abs(desiredMoveSpeed - lastDesiredMoveSpeed) > 4f &&
moveSpeed != 0)
        {
            StopAllCoroutines();
            StartCoroutine(SmoothlyLerpMoveSpeed());
        }
        else
        {
            moveSpeed = desiredMoveSpeed;
        }

        lastDesiredMoveSpeed = desiredMoveSpeed;
    }

    private IEnumerator SmoothlyLerpMoveSpeed()
    {
        // smoothly lerp movementSpeed to desired value
        float time = 0;
        float difference = Mathf.Abs(desiredMoveSpeed - moveSpeed);
        float startValue = moveSpeed;

        while (time < difference)
        {
            moveSpeed = Mathf.Lerp(startValue, desiredMoveSpeed, time /
difference);

            if (OnSlope())
            {
                float slopeAngle = Vector3.Angle(Vector3.up,
slopeHit.normal);
```

```
                float slopeAngleIncrease = 1 + (slopeAngle / 90f);

                time += Time.deltaTime * speedIncreaseMultiplier *
slopeIncreaseMultiplier * slopeAngleIncrease;
            }
            else
                time += Time.deltaTime * speedIncreaseMultiplier;

            yield return null;
        }

        moveSpeed = desiredMoveSpeed;
    }

    private void MovePlayer()
    {
        if (climbingScript.exitingWall) return;

        // calculate movement direction
        moveDirection = orientation.forward * verticalInput +
orientation.right * horizontalInput;

        // on slope
        if (OnSlope() && !exitingSlope)
        {
            rb.AddForce(GetSlopeMoveDirection(moveDirection) * moveSpeed *
20f, ForceMode.Force);

            // since we turn off the gravity on slope
            // if the player is moving upwards which means its y velocity
is greater than zero
            if (rb.velocity.y > 0)
            // we add a bit of downward force to keep the player
constantly on the slope
                rb.AddForce(Vector3.down * 80f, ForceMode.Force);
        }

        // on ground
        else if(grounded)
```

```
            rb.AddForce(moveDirection.normalized * moveSpeed * 10f,
ForceMode.Force);

        // in air
        else if(!grounded)
            rb.AddForce(moveDirection.normalized * moveSpeed * 10f *
airMultiplier, ForceMode.Force);

        // turn gravity off while on slope
        if (!wallrunning) rb.useGravity = !OnSlope();
    }

    private void SpeedControl()
    {
        // limiting speed on slope
        if (OnSlope() && !exitingSlope)
        {
            if (rb.velocity.magnitude > moveSpeed)
                rb.velocity = rb.velocity.normalized * moveSpeed;
        }

        // limiting speed on ground or in air
        else
        {
            Vector3 flatVel = new Vector3(rb.velocity.x, 0f,
rb.velocity.z);

            // limit velocity if needed
            if (flatVel.magnitude > moveSpeed)
            {
                Vector3 limitedVel = flatVel.normalized * moveSpeed;
                rb.velocity = new Vector3(limitedVel.x, rb.velocity.y,
limitedVel.z);
            }
        }
    }

    private void Jump()
    {
        exitingSlope = true;
```

```
        // reset y velocity
        rb.velocity = new Vector3(rb.velocity.x, 0f, rb.velocity.z);

        rb.AddForce(transform.up * jumpForce, ForceMode.Impulse);
    }
    private void ResetJump()
    {
        readyToJump = true;

        exitingSlope = false;
    }

    public bool OnSlope()
    {
        if(Physics.Raycast(transform.position, Vector3.down, out slopeHit,
playerHeight * 0.5f + 0.3f))
        {
            // Calculate the angle between the player's direction and the
surface normal
            float angle = Vector3.Angle(Vector3.up, slopeHit.normal);

            // Determine if the angle is within the acceptable slope range
            return angle < maxSlopeAngle && angle != 0;
        }
        return false;
    }

    public Vector3 GetSlopeMoveDirection(Vector3 direction)
    {
        return Vector3.ProjectOnPlane(direction,
slopeHit.normal).normalized;
    }

    private void GroundCheck2()
    {
        grounded = false;
        onSteepGround = false;

        // Cast multiple rays downward from the player's position
```

```
        for (int i = 0; i < numRaycasts; i++)
        {
            float angle = i * (360f / numRaycasts); // Calculate angle for
raycast direction
            Vector3 direction = Quaternion.AngleAxis(angle, transform.up)
* -transform.forward; // Calculate raycast direction

            //groundCheckDistance = playerHeight * 0.5f + 0.2f;

            RaycastHit hit;
            if (Physics.Raycast(transform.position, Vector3.down, out hit,
playerHeight * 0.5f + 0.2f, whatIsGround))
            //if (Physics.Raycast(transform.position, direction, out hit,
groundCheckDistance, whatIsGround))
            {
                grounded = true;

                // Check if the slope angle exceeds the threshold
                float slopeAngle = Vector3.Angle(hit.normal, Vector3.up);
                if (slopeAngle > slopeThreshold)
                {
                    onSteepGround = true;
                    break; // Exit loop if a steep slope is detected
                }
            }
        }
    }

    private void GroundCheck() // work
    {
        // Cast a single raycast straight down from the player's position
        RaycastHit hit;
        if (Physics.Raycast(transform.position, Vector3.down, out hit,
playerHeight * 0.5f + 0.2f, whatIsGround))
        {
            grounded = true;

            // Check if the slope angle exceeds the threshold
            float slopeAngle = Vector3.Angle(hit.normal, Vector3.up);
            if (slopeAngle > maxSlopeAngle)
```

```
            {
                onSteepGround = true;
            }
            else
            {
                onSteepGround = false;
            }
        }
        else
        {
            grounded = false;
            onSteepGround = false;
        }
    }
}
```

Full LEDGE CLIMBING SYSTEM in 11 MINUTES - Unity Tutorial

https://www.youtube.com/watch?v=72b4P3AztH4

THIRD PERSON MOVEMENT in 11 MINUTES - Unity Tutorial

https://www.youtube.com/watch?v=UCwwn2q4Vys

Different Orbits value for CinemachineFreeLook
https://youtu.be/UCwwn2q4Vys?si=WsGNXDFBfr4Ftr4o&t=145