Plan Oneirous

#Moba #LAN #PVP #Top-Down

Summary

This game is a top-down Local Area Network multiplayer strategy game inspired by the “Ability Draft” mode in Dota 2.
Players can choose skills freely and construct their own character. They can try different combinations to achieve different effects, and fight with others to see who has a better comb and who is better at controlling his/her character.

made with Blender unity

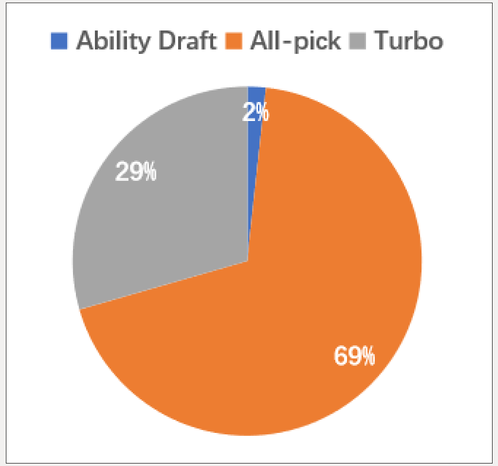
Idea & Design Goal

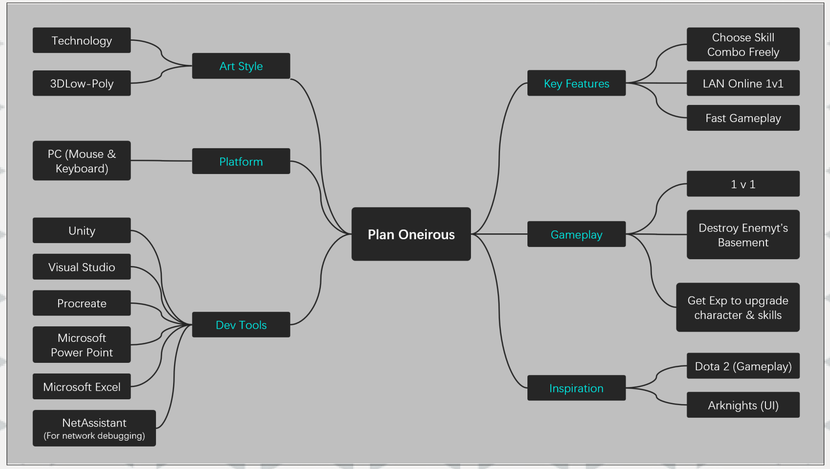
The “Ability Draft” mode in Dota 2 is interesting, but the skills are too complex that it’s almost impossible for players to predict how their skill combinations would work. Also, due the mechanic that players choose skills in turn, it takes over 5 minutes for players to choose skills, which is quite boring. Therefore, I designed this game, aiming to provide players a simple, fast, and exciting playing experience.

- In January of 2024, Dota 2 had about 12,515,000 matches in total, while only about 217,000 of them are in ability-draft mode, witch means that only 1 out of 57 matches is Ability Draft mode. Since normally, waiting for a normal match takes 10~90 seconds, simply waiting for an Ability Draft match might take 10 or more minutes. According to a user in Reddit, for many times he couldn’t find an Ability Draft match for more than 40 minutes.

- This leads to a vicious circle: the long waiting time for Ability Draft mode decreases number of players willing to play it, which further extends the waiting time for the match.

- Besides, due to the difficulty of getting interesting combos in an Ability Draft match, many players would choose to abandon the game very quickly, also causing fewer people willing to play that mode.





Stop Abandoning Ability Draft Games

Shoutout

I hear all the time things like: "go play ranked if you are that serious AD is for only fun"

I theoretically must be able to play the freakin' game to enjoy it

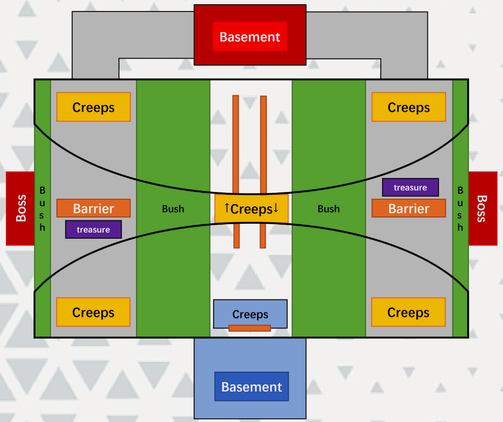
Waiting at least 20 minutes for one game is already effectively annoying so stop multiplying the suffering

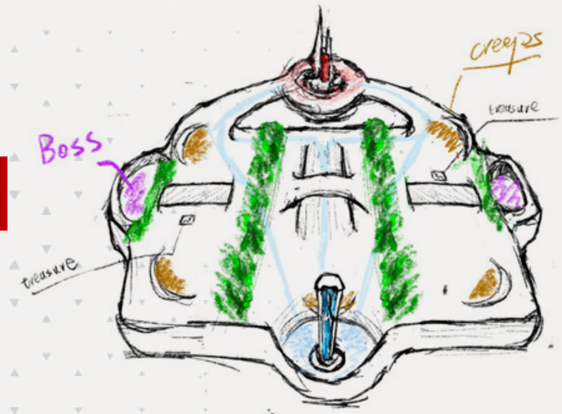
Is ability draft dead? 40 min in queue and no AD games for last 3 weeks.

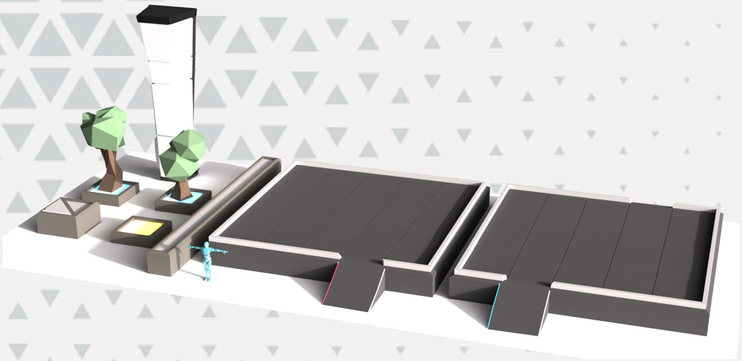
I have been trying to queue for ability draft multiple times this week, but I cannot get a match no matter what time of day I play. Usually, I end up queueing for about 30-50 minutes before I give up and go play something else. I normally play in AUS servers, but I tried expanding the search to U.S east and west as well, with no results (Even though they have pretty bad ping from here).

At first I thought that it may have just been more people playing the events and trying to finish cavern before battle pass ended, but there has been no change since end of battle pass. Ability draft was pretty much the only dota mode I would play, but now I haven't been able to find a AD game for like 2-3 weeks. I can still find all-pick games just fine, and low priority single draft was decently populated too, so I'm really not sure what changed.

Map Design & Modeling

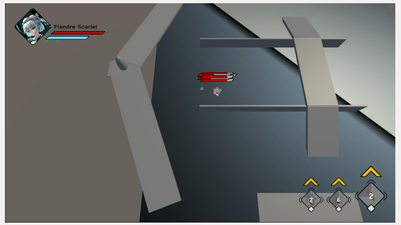




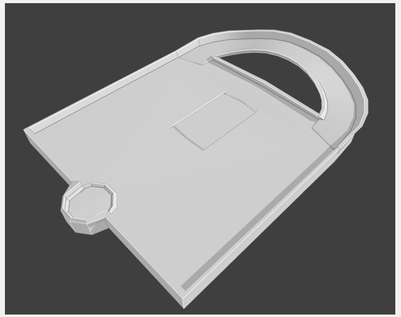


Elements Modeling

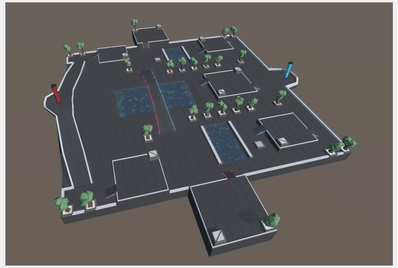
(All models made by myself, except for the character, which was downloaded from Mixamo)



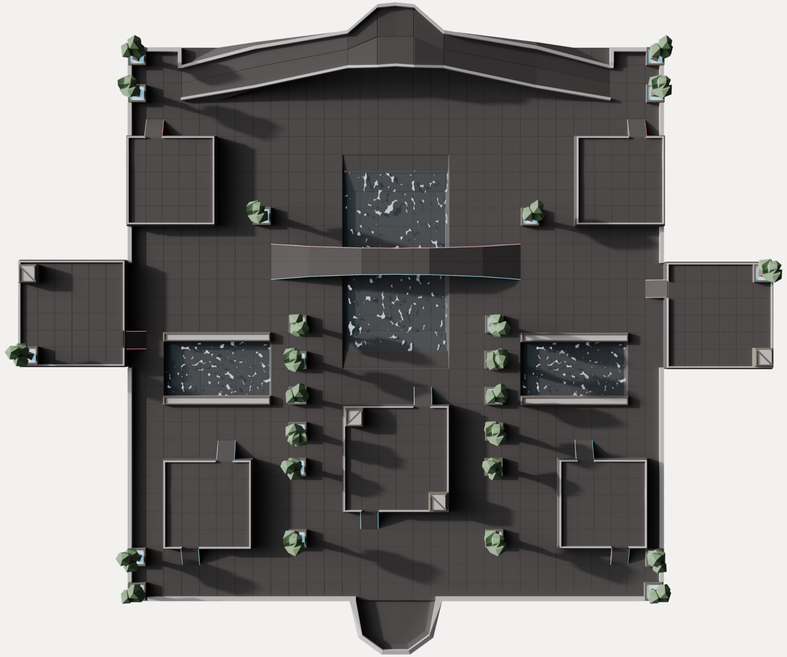
Map – WhiteBox



Map – WhiteBox v2



Final Map in Unity



Final Map from Blender

Skills

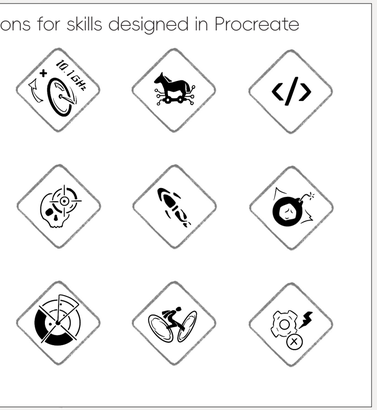
UI in Preparing Room

(1 in 2) Normal Attack			
Name	Bullet	Network Attack	
Type	Normal Attack	Normal Attack	
Target	Single Enemy	Single Enemy	
Charge	1	1	
Cool Down	0.2	0.5	
Cost	0	0	
Damage Type	Physical	Digital	
Range	200	500	
Damage	30	90	
Description	Attack the enemy with bullets.	Attack the enemy through network.	

(2 in 6) Basic Skill			
Name	Overclocking	Trojan	GameObject.Destroy
Type	Active	Active	Passive
Target	Self	Single Enemy	
Charge	1	1	1
Cool Down	30 / 25 / 20 / 15	20 / 15 / 10 / 5	5 / 3 / 2 / 0.5
Cost	50 / 45 / 40 / 40	20 / 15 / 12 / 10	-
Damage Type	-	Digital	Digital
Range	-	100	-
Description	Increase 10% damage and 15% attack frequency for 10 seconds.	Add "infected" debuff to the enemy, which increases the damage it receives by 15% and decreases its moving speed by 50%, dealing 10 damage to it every second. Lasts 10 seconds.	When the enemy attacked has less than 10% of its max HP, deals a damage equals to this value. If the enemy has "infected" debuff, the threshold is increased to 25%.
Data	<d>15 / 30 / 45 / 60</d> <f>10 / 15 / 20 / 25</f> <t>5 / 7 / 10 / 15</t>	20 / 30 / 50 / 70 <s>15 / 30 / 45 / 60</s> <d>20 / 40 / 70 / 100</d> <t>5 / 7 / 10 / 15</t>	-
Name	Head Shot	Power Shot	Ice Bomb!
Type	Passive	Active	Active
Target		Multiple Enemies	Multiple Enemies
Charge	-	3	5
Cool Down	-	30 / 25 / 15 / 10	40 / 30 / 20 /15
Cost	-	50 / 100 / 150 / 175	150 / 200 / 200 / 200
Damage Type	-	Physical	Physical
Range	-	1000	150

I designed the skills in Excel, then converted them into a form similar to XML so that the game can read data of skills from the text.

Icons for skills designed in Procreate



```
27 个引用
public static string GetTag(string s, string tag) {
    try {
        int idx = s.IndexOf("<" + tag + ">");
        if (idx != -1) {
            return s.Substring(idx + tag.Length + 2,
                s.Substring(idx + tag.Length + 2).IndexOf("</" + tag + ">"));
        }
    } catch (Exception e) { Debug.Log(e.Message); }

    Debug.Log("Tag Not Found! Tag: " + tag + "\nStr: " + s);
    return "";
}

2 个引用
public static string GetTag(string tag) {
    return GetTag(fileContent, tag);
}
```

```
7 个引用
public float AtCurrLevel(string a) {
    try {
        if (a.IndexOf(" / ") != -1) {
            return float.Parse(a.Split(" / ")[level > 0 ? level - 1 : 0]);
        }
        else if (!a.Contains("-")) return float.Parse(a);
        else return 0;
    } catch {
        return 0;
    }

}
4 个引用
public void UpdateSkillInfo() {
    float countDownR = countDown / i_coolDown;
    i_coolDown = AtCurrLevel(coolDownS);
    countDown = i_coolDown * countDownR;
    i_cost = AtCurrLevel(costS);
    i_range = AtCurrLevel(rangeS);
    i_secondRange = AtCurrLevel(secondRangeS);
}
```

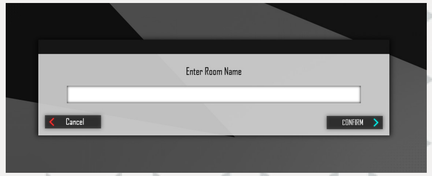
```
1 个引用
public static Skill GetSkillInfo(Skill s) {
    SetFile("Resources/Data/Skills");
    string str = GetTag(s.skillName);
    s.coolDownS = GetTag(str, "coolDown");
    s.rangeS = GetTag(str, "range");
    s.costS = GetTag(str, "cost");
    s.charge = Int(GetTag(str, "charge"));
    Enum.TryParse(GetTag(str, "type"), out SkillType skillType);
    Enum.TryParse(GetTag(str, "damageType"), out DamageType damageType);
    s.skillType = skillType;
    s.damageType = damageType;
    if (skillType == SkillType.Active) {
        Enum.TryParse(GetTag(str, "target"), out Target target);
        s.target = target;
        if (target == Target.Circle || target == Target.Rect)
            s.secondRangeS = GetTag(str, "range2");
    }
    if (skillType == SkillType.Normal) {
        s.damage = Int(GetTag(str, "damage"));
    }
    else {
        s.data = GetTag(str, "data");
    }
    s.description = GetTag(str, "description");
    return s;
}
```

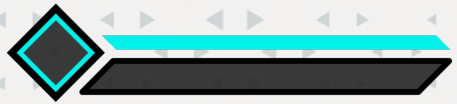
I worte methods to get data for a skill from the text file.

UI Design

UI for Battle Settlement

UI for Message & Input Box





Final UI in Battle

Technical Art Prototype

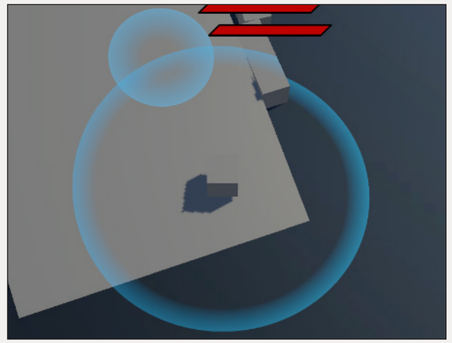
- Skill Range Indicator

v1.0:

Using Sprite Renderer to indicate a skill's range.

Problem:

Would be blocked by models when the map is not flat.



(v2.0)Solution:

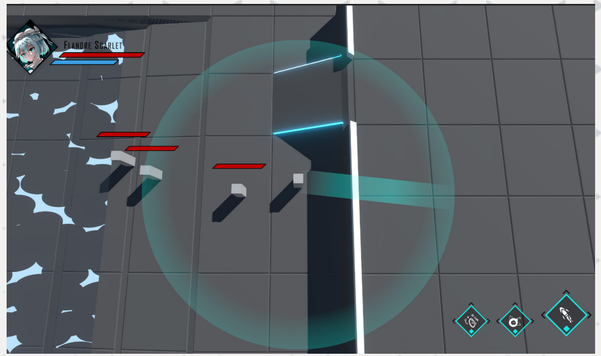
Use a projector instead of a Sprite Renderer

Problem:

Sometimes the range's image would be stretched, not continuous.

(v3.0)Solution:

Use back to Sprite Renderer, but assigning it a material that has a shader with "ZTest Always", which allows the skill's range to be shown even if something is in front of it.

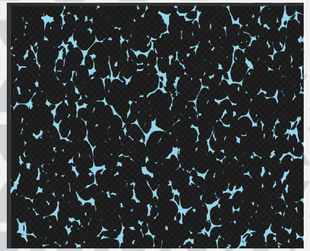


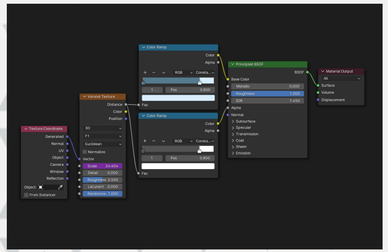
```
SubShader
{
    Tags {"RenderType" = "Opaque" "I
    LOD 100

    Blend [_SrcBlend][_DstBlend]
    ZWrite [_ZWrite]
    Cull [_Cull]
    ZTest Always
```

Technical Art Prototype

-Water

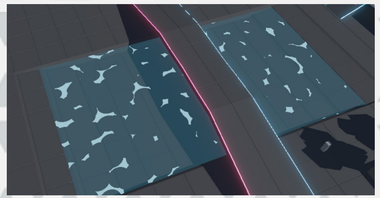




v1.0: Exporting a texture from a shader I wrote in blender.

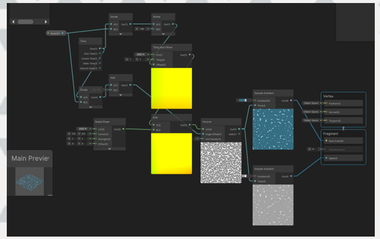
Problem:

Water surface is not moving.



(v2.0)Solution:

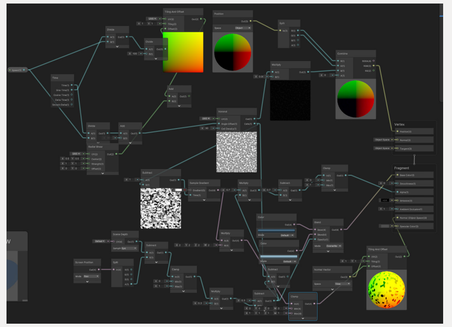
Write a similar shader graph in Unity.

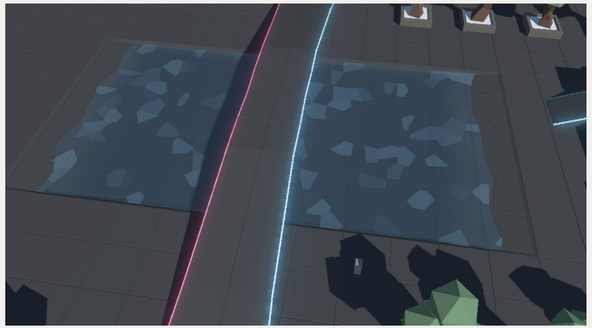


Problem:

Only texture is moving, the water's model is not moving.

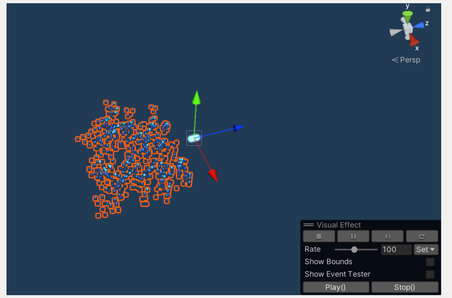
(v3.0)Solution: Still use shader graph, but adding many nodes to make the water's model move

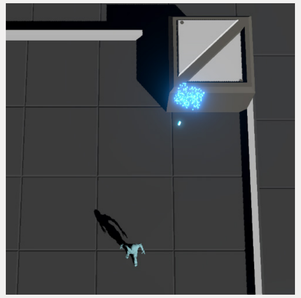


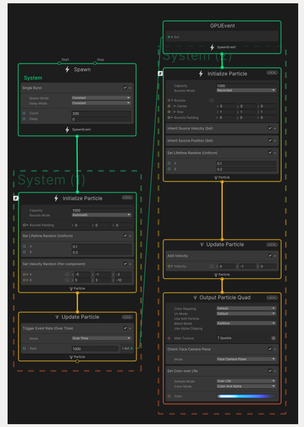


- Bullet hit Visual FX

Using an VFX Graph







Programming

At first, I tried to use multiple UdpClient instances (provided by c#) to **manage network broadcasting & discovering of rooms.**

Problem:

I can't create multiple UdpClients using the same port at the same time, so it's quite complex if I use separate UdpClient instances to control & receive network messages.

Solution:

I wrote a Serializable struct NetworkMsg to store a network request. (I used JsonUtility to convert between the struct and string) The "type" is an enum variable that indicates the type of this request. I also worte a new NetworkSystem class and a CustomUDP class that handle network requests & save the IP Adress of the other player. The "MsgReceiveCallBack" method is the method called whenever the UdpClient Receives a message, and will determine what to do according to the "type" attribute of the NetworkMsg.

```
[Serializable]
21 个引用
public enum Msg {
    RoomBroadcast,
    EnterRoom,
    CheckConnection,
    UseSkill,
    UpdateCharacterInfo, UpdateCreepInfo, UpdateBuildingInfo, UpdateRoomInfo,
    Attack, Attacked,
    SpawnCreep,
    UpdateCharacterID
}

[Serializable]
19 个引用
public struct NetworkMsg {
    public Msg type;
    public string[] data;
    10 个引用
    public NetworkMsg(Msg type, params string[] a) {
        this.type = type;
        data = a;
    }
}
```

```
1 个引用
public class CustomUDP : UdpClient {
    public IPEndPoint sendToPoint;

    3 个引用
    public CustomUDP(bool init = true) : base(NetworkSystem.listeningPort) {
        if (init) {
            Initialize();
        }
    }
    0 个引用
    public CustomUDP(int port, bool init = true) : base(port) {
        if (init) {
            Initialize();
        }
    }
    4 个引用
    public void Initialize(IPAddress address = null) {
        if (address == null) {
            address = IPAddress.Broadcast;
        }
        sendToPoint = new IPEndPoint(address, NetworkSystem.sendToPort);
        StartRcv();
    }

    2 个引用
    public void SetSendIP(IPAddress IP) {
        sendToPoint = new IPEndPoint(IP, NetworkSystem.sendToPort);
    }

    3 个引用
    public void StartRcv() {
        BeginReceive(new AsyncCallback(MsgReceiveCallback), null);
    }

    2 个引用
    public void Send(NetworkMsg msg) {
        NetworkSystem.SendMsg(msg, sendToPoint);
    }

    1 个引用
    public void MsgReceiveCallback(IAsyncResult ar) {
        //CommissionSystem.actions.Add(() => CustomElements.DisplayMsg("Msg"));
        //CommissionSystem.actions.Add(() => CustomElements.DisplayMsg("IP: " + NetworkSystem.sendToPort + ", " + sendToPoint.Port));
        IPEndPoint fromIP = new(IPAddress.Broadcast, NetworkSystem.sendToPort);
        NetworkMsg msg = NetworkSystem.ToMsg(this, ar, ref fromIP);
        fromIP.Port = NetworkSystem.sendToPort;
        string currScene = CustomElements.currScene;
        CommissionSystem.actions.Add(() => {
            switch (msg.type) {
                case Msg.RoomBroadcast:
                    if (currScene == "RoomSelection") {
                        try {
                            RoomSelection.AddRoom(RoomElement.Create(msg.data[0], msg.data[1],
                                                                     fromIP));
                        } catch (exception e) {
```

```
public static class NetworkSystem {
    public static CustomUDP udpClient;
    public static int sendToPort = 8887, listeningPort = 8888;
    0 个引用
    public static void SetSvrPort(int port) {
        listeningPort = port;
        udpClient.Dispose();
        udpClient.Close();
        udpClient = new CustomUDP();
    }
    public
    public static void AskForNcPort() {
        MsgBox.Create("Enter listening Port", MsgBoxType.Input, (bool confirm, string s) => { if (confirm) SetSvcPort(int.Parse(s)); }, listeningPort.ToString());
    }
    0 个引用
    public static void AskForSendingPort() {
        MsgBox.Create("Enter PJ Port", MsgBoxType.Input, (bool confirm, string s) => { if (confirm) sendToPort = int.Parse(s); }, sendToPort.ToString());
    }
    1 个引用
    private static byte[] ToBytes(NetworkMsg msg) {
        return Encoding.ASCII.GetBytes(JsonUtility.ToJson(msg));
    }

    0 个引用
    public static NetworkMsg ToMsg(UdpClient client, IAsyncResult ar) {
        IPEndPoint point = null;
        return ToMsg(client, ar, ref point);
    }
    3 个引用
    public static NetworkMsg ToMsg(UdpClient client, IAsyncResult ar, ref IPEndPoint point) {
        byte[] receiveBytes = client.EndReceive(ar, ref point);
        string receiveString = Encoding.ASCII.GetString(receiveBytes);
        return JsonUtility.FromJson<NetworkMsg>(str);
    }

    0 个引用
    public static void SendMsg(NetworkMsg msg, IPEndPoint point = null) {
        var bytes = ToBytes(msg);
        if (point == null)
            udpClient.Send(bytes, bytes.Length, udpClient.sendToPoint);
        else {
            udpClient.Send(bytes, bytes.Length, point);
        }
    }
    2 个引用
    public static void SendMsg(NetworkMsg msg, IPEndPoint point, UdpClient client = null) {
        var bytes = ToBytes(msg);
        client.Send(bytes, bytes.Length, point);
    }
```

Then, I met problems when **synchronizing the state of characters & creeps (neutral units),** since objects have different "InstanceID".

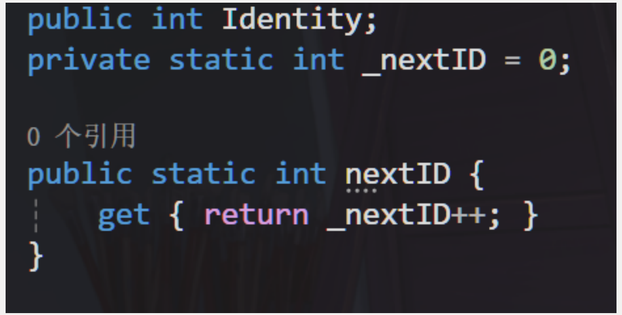
(v1.0) Solution:

Assigning an int ID to every unit I need to sycronize across the internet.

Problem: ID still differs since the order units created are different.

(v2.0) Solution:

I worte a struct UnitID to identify units across network. To solve the problem of mismatch, the host now sends a NetworkMsg with corresponding attributes to let the client create an object with a specific UnitID.



```
public int Identity;
private static int _nextID = 0;

0 个引用
public static int nextID {
    get { return _nextID++; }
}
```

```
1 个引用
public static void StartBattle(params Skill[] skills) {
    SceneSwitching.SwitchTo("Battle");
    room = RoomScene.room;
    init = () => {
        Player.localPlayer.character = Character.Create(skills);
        localCharacter = Character.localCharacter;

        if (side == UnitSide.Blue) {
            rebornPoint = rebornPoint_Blue;
            room.player2.character = Character.Create();
            enemyCharacter = room.player2.character;
        }
        else {
            rebornPoint = rebornPoint_Red;
            room.player1.character = Character.Create();
            enemyCharacter = room.player1.character;
        }
        localCharacter.SetLocation(rebornPoint);
        if (room.isHost)
            NetworkSystem.SendMsg(new(Msg.UpdateCharacterID,
                room.player1.character.ID.ToString(), room.player2.character.ID.ToString()));

        Player.localPlayer.enabled = true;
        instance.StartCoroutine(SendCharacterInfo());
        instance.StartCoroutine(ResetStartTime());
    };
}
```

```
6 个引用
public enum UnitType {
    Character, Creep, Basement
}

10 个引用
public enum UnitSide {
    Blue, Red, Neutral
}

[Serializable]
22 个引用
public struct UnitID {
    public UnitType type;
    public UnitSide side;
    public int id;
    public static int[] idLst;

    3 个引用
    public UnitID(UnitType t, UnitSide s) {
        if (idLst == null) {
            idLst = new int[Enum.GetValues(typeof(UnitType)).Length];
        }
        type = t;
        side = s;
        id = ++idLst[(int)t];
    }

    3 个引用
    public override string ToString() {
        return JsonUtility.ToJson(this);
    }
    3 个引用
    public static UnitID Parse(string s) {
        return JsonUtility.FromJson<UnitID>(s);
    }
}
```

Playtesting

↑ Playtesting with Family Members

↑ Playtesting with Classmates

About Cotroling:

Since the game is currently using WASD and QEF to move & use skills, it's hard to use skills while moving. Using cliking to move (just like Dota) might work better.

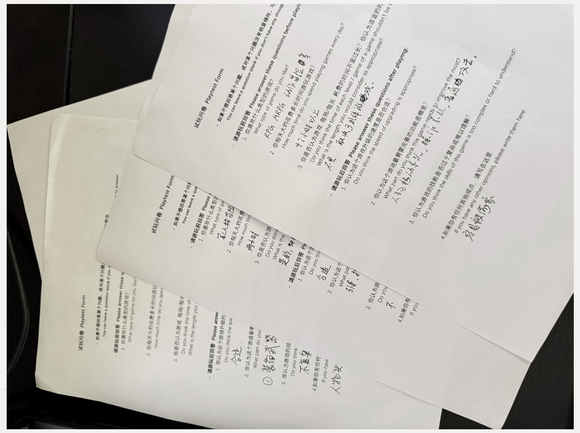
The bullets shot by players only move in a straight line, so most bullets will miss, which is quite weird in a Dota-like game.

After the target player selected was defeated, the game won't automatically lock to a nearby target, so players have to choose a target manually very often, which affects players' experience.

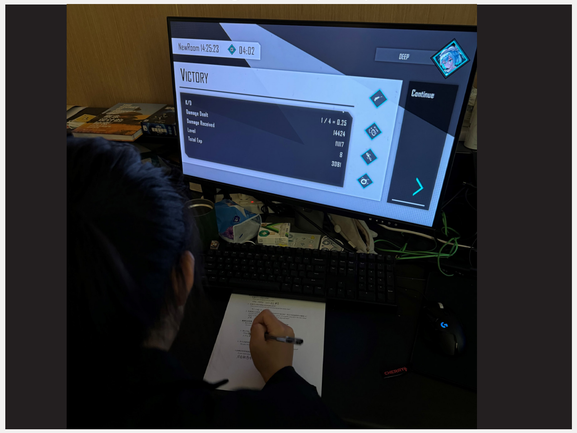
About guiding

The game doesn't give clear hints about what a player should do. Players don't even know that the goal was to destroy the opponent's basement.

Playtest Forms Recieved



Classmate filling the playtest form



Others:

Minimap should show the whole map, otherwise it would be too likely for the opponent to approach one's basement and win.

Negative feedback is not enough. Player have little chance to win once he / she has a lower level than the opponent.

There could be more mechanisms relating to the map. (E.g. reducing moving speed when in water)

The upgrade button of a skill is static, so player's don't know that it's a button.

试玩问卷 Playtest Form

- 如果不想回答某个问题，或对某个问题没有明显倾向，可以留空
  You can leave a question blank if you don't have any thoughts or prefer not to answer.

- 请游玩前回答 Please answer these questions before playing:
  1. 你喜欢什么类型的游戏?
     What type of game do you like?
  2. 你每天大约花费多长时间游玩游戏?
     How much time do you spend playing games every day?
  3. 你是否认为游戏 每局/每关 耗费的时间不宜过长? 你认为适宜的时长是多少?
     Do you think the time of each level / game of a game shouldn't be too long?
     What is the length you would consider as appropriate?

- 请游玩后回答 Please answer these questions after playing:
  1. 你认为这个游戏升级的速度是否合适?
     Do you think the speed of upgrading is appropriate?
  2. 你认为这个游戏最需要完善的功能是哪里?
     What part do you think this game needs to improve the most?
  3. 你认为游戏的技能是否过于复杂或难以理解?
     Do you think the skills of this game is too complex or hard to understand?
  4.如果你有任何其他观点，请写在这里:
     If you have any other opinions, please write them here:

Playtest Form