



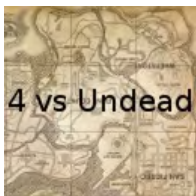


Warcra3 game mods by Damir Čohadarević a.k.a *cohadar*

This document represents my achievements in the wc3 modding scene.
Descriptions include images, gameplay spaces, events, and implementation details.

Following maps/mods will be presented here:

	Gyrocopter Arena 12 players ffa aerial shooter
	Pyramidal Defence 5 vs 5 team survival
	Archmage Survival 8 player coop survival
	Priest vs Necro 3 vs 3 mini aos/moba game
	4 vs Undead 4 player coop dungeon crawler

All maps can be downloaded from <http://www.epicwar.com/maps/>
I am currently most active at <http://www.wc3c.net/> but you can also find me on
<http://www.hiveworkshop.com> and <http://www.thehelper.net/>

Gyrocopter Arena - 12 players ffa aerial shooter



Cockpit view: Blue fires his machine guns, while Red blind-sides him in a kamikaze attack.

PREMISE

Up to 12 players can shoot each other in an aerial combat for 15 minutes. After the time is up, players are ranked by their kill score. Killed players are instantly revived and rejoin the dogfight.

GAMEPLAY

The game has semi-realistic physics, the world is a square box with glass walls that bounce the gyrocopter back if it tries to fly out. There is a maximum flying height (arbitrary) and a minimum flying height (a little above ground level). There are stone pillars around the map that represent the maximum height, gyrocopters take damage when crashing into them depending on the speed vector.

There are portals (the purple circle in the picture above) that players can use to fly to the other side of the map. Gyrocopters can increase some of their stats when they gain combat experience.

Players can pick up two additional weapon ammo types from the ground spawn points. More weapon types become available as the game progresses. Additional weapons are: bombs, carpet bombs, missiles, guided missiles, ion cannons (bounce off walls), BFG and Nuke. Picking up weapons from the ground makes players highly susceptible to bombarding attacks.

Gyrocopter Stats:

- Framework - Increases Hit Points
- Aerodynamics - Improves Speed and Maneuvering
- Retention - Increases Nitro tank capacity
- Hit Points - How much damage can a gyrocopter take before crashing
- Nitro - Used for fast acceleration
- Firepower - Adds damage to primary wing cannons
- Plating - Reduces collision damage

Based on the stats chosen during leveling there are various play styles, for example a good combination of nitro and plating is most suitable for a kamikaze style combat.



Free camera view: showing center of the map and 2 players.

CONTROLS & UI

Players control direction and speed with arrow keys, using (E) and (D) to raise or lower the gyrocopter. Players can also strafe (S) and use afterburn (A) for fast acceleration if they have enough nitro. Upper right corner displays time left till the game end. Below that is the scoreboard that can be minimized and below that a display panel with velocity, altitude and textual compass.

Players can choose between several camera views: frontal/cockpit view, bomber view(top-down) or free camera view.

IMPLEMENTATION

Biggest challenges: Keyboard bindings & movement, camera views and collision physics.

Arrow keys pressing and depressing had to be custom triggered to allow for smooth velocity and acceleration calculations, than it had to be connected with movement and maneuvering (default wc3 movement had to be disabled).

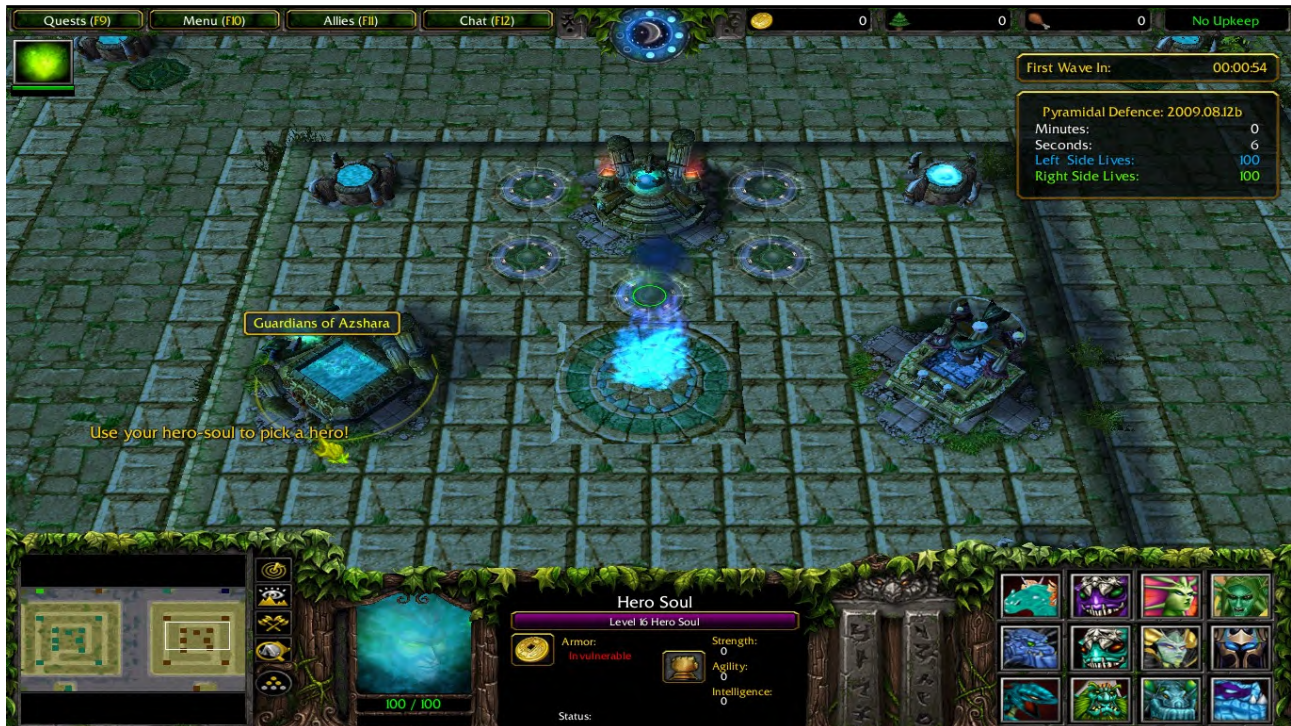
Camera views are basically all custom because wc3 only supports isometric perspective by default.

3D Collision physics was implemented for all objects in the game: gyrocopters, missiles, pillars and walls. This includes bouncing effects, crash damage calculation and resulting bouncing vector. Bombs also retain the speed vector of the gyrocopter so dropped bombs rarely fall purely vertical.



Frontal view: firing ion cannons

Pyramidal Defence – 5 vs 5 team survival



View on top of the pyramid, spawn points, shops and hero selection.

PREMISE

There are two teams of 5 players, each team has a pyramid. Teams defend the portal on top of their pyramid from incoming waves of computer controlled mobs. Mobs spawn in waves and each wave has different and stronger mobs than the one before. There are stairs at corners of the pyramid so mobs can climb the pyramids in circular patterns. Each team starts with 100 life points. When mob reaches the top of the pyramid the team loses a life point. Team that loses all life points first loses the game. Every unit, item and spell is themed on the Naga race.

GAMEPLAY

Game can be played as 5vs5 where teams try to outlast each other, or as survival of 5 heroes defending one pyramid where they try to beat the game by defeating all 15 levels of monsters.

Each mob wave spawns three leader units in addition to normal units. These units are bigger, stronger and have additional abilities that make life difficult for defenders. When a leader unit reaches a portal on top of the pyramid the team loses 4 lives. Team also loses one life when a hero from the team dies and needs to be revived.

Every unit in this game has a jump ability! This includes both heroes and mobs. At the start of the game it is possible to jump only down the walls of the pyramid, on later levels when hero agility increases significantly it is even possible to jump up the levels of the pyramid. Around the map are placed green circles (jump pads) that enable fast moving and coverage of different pyramid areas.

To buy permanent items you need to get lumber by killing leader mobs.

To buy temporary items you use gold that you get by killing normal mobs in a wave.

You also get some gold and lumber income at the start of each level.

Every hero has a 12 slot inventory (custom triggered because WC3 does not support this).

On top of the pyramid are 3 shops where you can get permanent items, potions can be purchased from tidal guardian defense towers. Tidal guardians do not attack mob waves, they only attack enemy heroes trying to climb your pyramid.



Defending first narrow pass: melee heroes blocking the path, ranged ones supporting from above.

IMPLEMENTATION

The biggest challenge in this game was **balancing** the leveling of heroes with the leveling of mobs and the stat decisions that players make. It turns out that wc3 Strength/Agility/Intelligence model does not scale well so I had to implement a **custom damage detection** and calculation effectively replacing default attack, armor and spell systems. This required custom triggering every spell but in the end enabled me to add some stuff that wc3 cannot support natively, like items that have a percent chance to block the spell or items that add or enhance spell critical damage.

The jump system required **3D vector engine** implementation and was complicated by the fact I used functions that give smooth transition when flying over terrain edges. When this is not done properly it can cause multiplayer games to disconnect players for synchronization reasons.

I made this vector engine primarily for jumping physics but it later turned out useful for giving some spells cool movement/knockback effects.

Item abilities and bonuses were also all custom triggered. This was required as a side effect of extending inventory from 6 to 12 slots which prevented me from using default wc3 item engine. This is my biggest map, it has 14800 lines of custom script code.



mobs entering the map: upper left corner

Archmage Survival – 8 players coop survival



First wave: zombies, we also see a green zombie (miniboss) at upper left part of the picture

PREMISE

Players are archmages locked in a limited area (survival arena) and levels of monsters arrive through portals and try to kill them. Death in this game is permanent unless you have an ankh of reincarnation and those items are expensive. Players win the game by outlasting all the waves and bosses. If you die your team can continue playing without you but their chances of success are slim.

GAMEPLAY

Players can learn 8 different fire based spells, firebolt, fireball, summon lava monster, wall of fire... On first level mages only have minor firebolt spell, other spells become available as they level up.

Monsters are all undead and they spawn from 8 different portals around the map. Every monster wave has one special differently colored unit (the miniboss) that gets a random ability boost. Every five levels a single monster Boss spawns. Boss units have more health, spells and more advanced AI than other undead. Heroes and Bosses use bolt spells that collide with objects so it is possible to use walls and pillars as cover.

Only permanent items in the game are dropped by big bosses and they modify and enhance mage spells. For example firebolt staff enables a mage to cast firebolt without any manacost.

Mini bosses drop tomes and runes. Potions can be purchased from central fountain. There are also purchasable gamechanger items that can be found in arcane vault at map corners. These are bag of potions, empty vial, blink dagger and a horse. Purchasing a horse gives both HP and movement bonuses but if mounted player dies horse is lost (even if mage reincarnates with an ankh)

Gameplay is fast and requires players to use arrow keys to fire firebolts and fireballs because using mouse only is too slow. Bolt spells have no cooldown, only manacost.

Mostly you run away and try to lead undead to narrow pass and then bombard them with spells when they group in an area. Boss fights are more difficult and require a higher level of cooperation from players.



IMPLEMENTATION

There is only one custom engine in this map: **The missile engine.**

It implements efficient movement of bolt spells (fireball, firebolt, death coil...) and detection of *collision with terrain obstacles*.

This is basically a very highly optimized **2D physics engine**. The amount of flying bolts can be daunting in full house games and since missile movement is rendered at 32 frames per second it was paramount to optimize it to prevent multiplayer lag. Full 2D physics physics might not seem like a big deal but this is not implemented at native game level but inside the scripting engine because wc3 missiles do not do terrain collision detection.

TRIVIA

I had to abandon this project due to lack of time some years ago so I made it open source. Modder with nickname MasterOfRa continued the development and added more levels to the game. After he abandoned his version some time later the game became unplayable due to changes in latest wc3 patches and my inability to recompile the game because MasterOfRa did not make his version open-source. All pictures here are from my original version.



A look at the two corner portals inside their arched hallways.

Priest vs Necro – 3 vs 3 AoS/MOBA game



Two merged pictures: Human base on the left, Undead base on the right.

PREMISE

AoS games are probably the most prevalent game type in wc3 community due to extreme popularity of DotA Allstars. I avoided making an AoS map for quite a long time because of oversaturation there. Basically everyone was making 5vs5 DotA clones and were just wasting their time. Finally I decided to make a niche AoS, a 3vs3 combat with only two hero types and one lane. This game type was aimed at small groups of close friends who liked AoS gamestyle and were looking for a perfectly balanced game without snowballing effects.

GAMEPLAY

Left side are humans, right side are undead. Human players control priest heroes with holy magics. Undead players control necromancer heroes with unholy magic. The human side of the map is green and has living plants, the undead side has blight and dead trees.

Units stats between human and undead units are symmetrical and spells between priests and necros are symmetrical/complemental so the game is perfectly balanced by default.

Gameplay is extremely fast, there is no walking to and from the base like in other AoS games. Basically you are always on the front line. This is ensured by two things: all heroes have teleportation staff, and all heroes can heal their allies. So allied combat and care for one another is very emphasized.

Both sides can purchase additional help from their natural allies around the map. Humans are allied with water elementals, while undead are allied with nerubians.

Gameplay is limited to 20 minutes so it is actually possible to play a draw game!

If one side gains a big push momentum by buying lots of units the other side can counter it by summoning a black dragon. This is a last resort move because black dragon is neutral hostile and will kill anything around him. Black dragon leaves after a short killing spree.



Ogres and tank fighting for human side, abomination and infernal machine fighting for undead

Every now and then big units are summoned to help one side or the other. This never happens at the same time for humans and undead so sides oscillate between periods of forward attack and fighting retreat gamestyles. This oscillation is even more pronounced by asymmetry of day/time. Humans see better(further into the fog of war) during the day, while undead see better at night. Also some human spells do not work during night time, and similar for some undead spells during day time.

IMPLEMENTATION

There are no special physics or spell engines in this game. I spent most time designing the terrain and ensuring the game is **perfectly balanced**. There is some advanced spellwork included because certain buffs interact with one another but nothing too special

This map is a reminder that one need not have many wow factors to make a decent and playable game, you just need a good set of rules and balanced PvP competition.



Various parts of map terrain with NPCs and shops.

4vsUndead – 4 player coop dungeon crawler



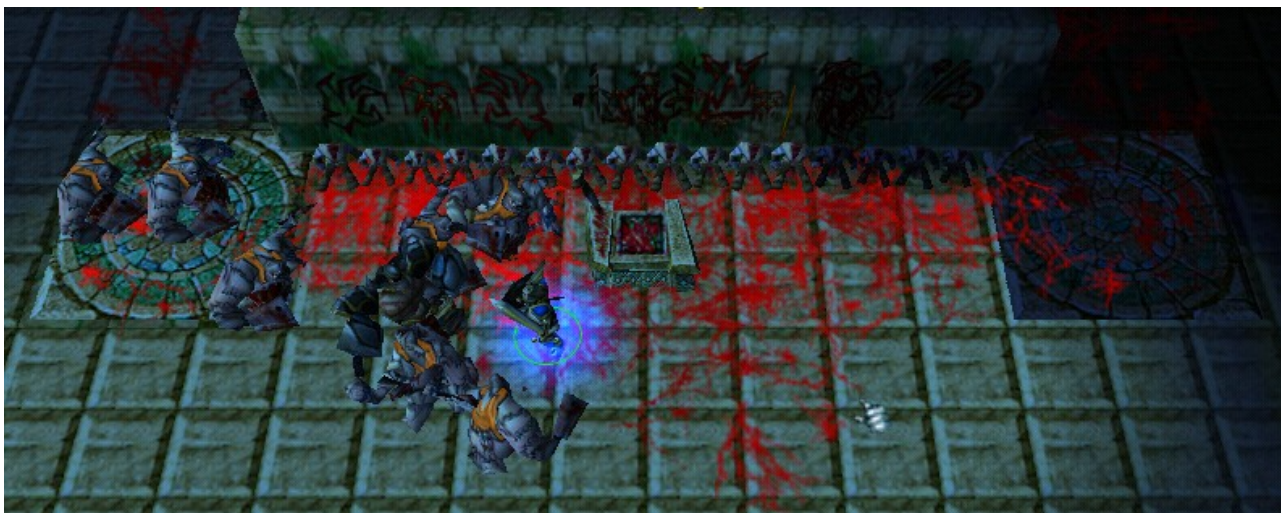
Four heroes descending the nerubian lair (one of later dungeons).

PREMISE

This is a classic dungeon crawler, hack and slash game. Four heroes must explore 8 dungeons, fight various monsters, defeat their bosses and finally slay the ultimate evil boss. Game is mostly based on diablo 2 gameplay but themes of heroes, monsters and spells are totally custom and unrelated to diablo world. Instead this game has a clear human+elf heroes vs undead theme.

GAMEPLAY

Each dungeon contains different monsters and as the game progresses heroes encounter increasingly more powerful monsters and bosses. Once the players enter the dungeon the monsters start spawning all around them, and they must defeat a number of small monsters and their mini bosses before a main boss for that level appears. Boss fights are highly scripted! Using brute force against them will result in certain defeat, instead players must think and react to Boss spells and ultimately cooperate to defeat them. Upon death bosses drop items. Players cannot progress to the next level before they kill the main boss in the current level. If players die they can revive each other with scrolls. If all players die at the same time, there is no one to revive them and they lose the game! There are destructible doodads inside dungeons that can be destroyed for random loot.



Butcher's dungeon: Swordsman fighting off abominations and flesh golem(mini boss).



Paladin entering the room of shadows: Dreadlord's zombie minions attack him.

IMPLEMENTATION

The main challenge in this game was making the **smart AI** for various Bosses and mini bosses. Boss actions are always scripted in such a way to prevent heroes from overpowering the boss with brute force even if they get great items and stat bonuses. While minibosses just basically fire all the spells they got when ever they can Bosses are smarter and preserve their most powerfull spells for later, often surprising the heroes when they think they are close to victory. Later bosses even employ deceiving magics and special magical effects that make heroes really think hard to win. Blindly attacking such bosses with all spells you have will result in certain defeat. For example Dreadlord boss can resurrect himself if players do not destroy his resurrection stone, Butcher can reverse the damage for a period of time so attacking him actually heals him and so on.

Second biggest challenge was **balancing** this game. I also wanted to make this game playable with any number of players between 1 and 4 so I had to script automatic adjustment to number of players. Since game can be played both in singleplayer and in multiplayer there has to exist balance both between hero levels and monster levels and between heroes themselves. I used exponential difficulty increase for monster levels. Through empirical evidence and later **automated testing** I found out that the best base for exponential difficulty increase is: 1.25^{LEVEL}

This is my second biggest map, it has 10287 lines of custom script code.



*Final level – Drowning Pools: Paragon faces the Drowned God (final boss)
Kraken rises from the depths to watch and eat anyone careless enough to get too close.*