

■ Game Ideas for Visually Impaired Players

Audio Games & Extensions for the Virtual Balloon Shooter

Based on STM32F401 Microcontroller Platform

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1. New Game Concepts

These game ideas can be developed using similar hardware to the Virtual Balloon Shooter. Each game uses audio and tactile feedback to create an immersive experience for visually impaired players.

1.1 Audio Treasure Hunt ■

A relaxing search game where the player must find a hidden treasure using audio cues.

Aspect	Description
Goal	Find the "treasure" in a 3D audio space
Feedback	Warmer/colder via pitch + heartbeat rhythm when close
Difficulty	Treasure slowly moves away if player waits too long
Hardware	Same as Balloon Shooter

1.2 Sound Pong / Audio Tennis ■

A Pong-style game where the player must hit a ball back based on sound positioning.

Aspect	Description
Goal	Hit the ball back before it passes you
Feedback	Ball makes sound that moves from left to right (stereo)
Action	Press trigger when ball is "in the middle"
Variation	Ball speeds up as game progresses
Extra Hardware	Stereo speakers (left/right) instead of mono

1.3 Memory Match ■

Remember and repeat sound patterns - a Simon Says style game for cognitive training.

Aspect	Description
Goal	Repeat a sequence of sounds/directions
Gameplay	System plays: "left, up, right" → player points same sequence
Feedback	Different tones for each direction
Difficulty	Sequence gets longer each round
Hardware	Same as Balloon Shooter

1.4 Zombie Survival / Horde Defense ■

More exciting than balloons - enemies come from all directions! A thrilling survival experience.

Aspect	Description
Goal	Shoot zombies before they reach you
Feedback	Zombies make growling sounds, volume = distance
Tension	Multiple zombies at once, faster zombies in later rounds
Bonus	Power-ups at random locations (recognizable sound)
Hardware	Same + optional extra speakers for spatial audio

1.5 Fishing Game ■

A relaxing game with patience as the core mechanic. Perfect for a calm gaming session.

Aspect	Description
Goal	Catch fish by pressing at the right moment
Gameplay	Aim rod (gyro), wait for "splash" sound, press trigger with correct timing
Feedback	Vibration motor = fish is biting, timing is crucial
Variation	Different fish = different sounds + points

1.6 Audio Maze ■

Navigate through an invisible maze using only sound cues. A unique and immersive experience.

Aspect	Description
Goal	Find the exit of the maze
Movement	Gyro = look direction, button = step forward
Feedback	Walls make echo/reflection sound, open path = silence
Help	Compass tone points toward exit
Extra	Collect keys to open doors

1.7 Rhythm Shooter ■

Combination of music game and shooting. Shoot to the beat for bonus points!

Aspect	Description
Goal	Shoot in sync with the music beat
Gameplay	Balloons appear synchronized with music
Feedback	Perfect timing = bonus points + satisfying sound
Difficulty	Faster songs = harder gameplay

2. Balloon Shooter Extensions

These extensions can be added to the existing Virtual Balloon Shooter to enhance gameplay, add variety, and increase replayability.

2.1 Difficulty Levels

Allow players to choose their challenge level. Implement via number of Start button presses.

Level	HIT_RADIUS	Balloon Behavior	Play Time
Easy	20°	Stationary	180 sec
Normal	15°	Stationary	120 sec
Hard	10°	Slow moving	90 sec
Expert	6°	Fast moving + dodging	60 sec

2.2 Moving Balloons ■■

Balloons slowly drift around instead of staying still. They bounce off VPA boundaries. Speed can increase with difficulty level.

Implementation: Add BALLOON_SPEED constant (degrees/second), update position every 100ms, reverse direction when hitting VPA edges.

2.3 Combo System ■

Reward fast consecutive hits with bonus points and special sound effects.

Combo	Condition	Bonus
2x	2 hits within 5 sec	"Double!" + 1 extra point
3x	3 hits within 8 sec	"Triple!" + 2 extra points
5x	5 hits within 15 sec	"Unstoppable!" + 5 extra points

2.4 Power-ups ■

Randomly appearing bonuses with unique sounds. Player must aim and shoot to collect.

Power-up	Effect	Sound
■ Big Target	HIT_RADIUS x2 for 15 sec	Rising bell
■■ Time Bonus	+30 seconds	Clock tick-tock

■ Multi-pop	Next shot hits ALL balloons in range	Explosion preview
■ Magnet	Balloon moves toward player	Suction sound

2.5 Different Balloon Types ■■■■■

Various balloon types with different sounds, points, and behaviors.

Type	Sound	Points	Behavior
Normal	Standard	1	Stationary
Golden	High bell	3	Moves fast, disappears after 5 sec
Bomb ■	Threatening ticking	-2	Do not shoot!
Bonus	Happy melody	5	Rare, small target

2.6 Multiplayer Mode ■

Two players, each with their own controller. Requires additional buttons (PA3/PA4).

Mode	Description
Co-op	Work together, shared score
Versus	Take turns shooting, highest score wins
Duel	Same balloon, who shoots first?

2.7 Achievements & Statistics ■

Save progress on SD card in a stats.txt file. Play special sound when achievement unlocked.

Achievement	Condition
■ Sharpshooter	10 hits in a row without missing
■ Speed Demon	5 balloons in 30 seconds
■ Perfectionist	100% accuracy in one game
■ Veteran	100 games played
■ High Score	Personal record broken

2.8 Training Mode ■

No time limit, ideal for new players to learn the controls and feedback system.

Feature	Description
No timer	Practice without pressure
Hints	"The balloon is to your left" after 10 sec of no movement
Larger target	HIT_RADIUS = 25°
More feedback	Extra explanation on miss ("Too high!", "Too far left!")

2.9 Soundscapes / Themes ■■■■

Different environments with unique ambient sounds and themed audio effects.

Theme	Background Sound	Target	Pop Sound
Carnival	Happy music	Balloon	Bang
Space	Ambient space	Alien	Laser zap
Ocean	Waves	Bubble	Plop
Jungle	Birds + insects	Butterfly	Whoosh

2.10 Progressive Mode (Endless) ■■

Play as long as possible with increasing difficulty. Great for competitive play.

Round	Balloons	HIT_RADIUS	Special
1-5	1 at a time	18°	Normal
6-10	1-2 at a time	15°	Moving balloons
11-15	2 at a time	12°	Faster movement
16-20	2-3 at a time	10°	Bomb balloons
21+	3 at a time	8°	Everything combined!

3. Hardware Extensions

Optional hardware additions to enhance the gaming experience.

Extension	Benefit	Estimated Cost
Stereo speakers	Left/right audio positioning	€10-20
Bone conduction headset	Player can also hear surroundings	€30-50
Second vibration motor	Left/right tactile feedback	€5
4x push buttons	Up/down/left/right input	€5
Haptic feedback motor	More nuanced vibrations	€10-15
Bluetooth module	Wireless audio / multiplayer	€10-15
Battery pack	Portable gaming	€15-25

4. Implementation Priority

Ranked by ease of implementation and impact on gameplay.

Quick Wins (Easy to Implement)

Extension	Estimated Time	Complexity
Difficulty levels	2 hours	■
Training mode	2 hours	■
Combo system	3 hours	■■
High score saving	3 hours	■■
Moving balloons	4 hours	■■
Different balloon types	5 hours	■■■
Power-ups	6 hours	■■■
Achievements system	6 hours	■■■
Multiplayer mode	8 hours	■■■■

Recommended Development Order

Phase 1 - Core Improvements: Difficulty levels, Training mode, Moving balloons

Phase 2 - Engagement: Combo system, Different balloon types, High score saving

Phase 3 - Advanced Features: Power-ups, Achievements, Soundscapes/Themes

Phase 4 - Social: Multiplayer mode

Phase 5 - New Games: Zombie Survival (reuses 90% of code), Memory Match, Audio Maze