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Voice Tech In the Multiverse: Superhero Universe

**Part 1: World Analysis**

SoundWave is a masked vigilante who controls sound waves to manipulate environments, communicate across long distances, and capture foes in the name of justice for Echo City.

**Acoustic Challenges**:

* SoundWave generates such an overwhelming noise that normal microphones would be easily destroyed.
* Some frequencies that SoundWave can produce may be either too low or too high for the human ear to perceive.
* Environments can collapse if SoundWave’s voice is left unchecked.

**Environmental Factors**:

* Gravity Altering Pulsers scattered around Echo City pose a problem to SoundWave as gravity changes how fast sound travels, making it difficult for SoundWave to use his powers in a time of need.
* Echo City’s metal buildings reflect sound too much, which creates sound traps for SoundWave as this would make using his powers a double-edged sword.
* The criminals of Echo City have technologies that mess with electronics (EMPs), which makes normal voice systems unreliable.

**User Characteristics**:

* SoundWave’s vocal anatomy includes dual vocal cords, one is used for his regular voice, which is how he keeps his identity hidden, and the other is the source of his supersonic voice.
* Brain Implants are one of the main concerns for Echo City, as criminals have used these to change the sound of their voice.

**Noise Sources**:

* Siren, SoundWave’s nemesis’s constantly blasting makes unpleasant sounds that mess with the city’s speech systems.
* Echo City is full of loud noises such as sound cannons, loud cars, and the voices of the overcrowded population.

**Part 2: Technical Solutions Design: The Echo Grid**

**Preprocessing Pipeline Flow**:

1. Voice Control: This keeps super loud sounds from blowing out the system.
2. Noise Filter: Blocks out any annoying background sounds that are caused by Echo City’s Villains.
3. Sound Booster: This booster helps low rumbles and power pulses get picked up clearly.
4. Smart Sound Analyzer: This breaks sound into tiny pieces over time.
5. Auto Adjuster: Balances sound levels, which helps everything stay smooth and clear.
6. Sound Info Collector: Pulls out key sound features so the system is able to understand speech.

**Why MFCCs Fall Short**:

* They expect sounds to stay in a small range as well as be steady, both useless in echo-dense, frequency-shifting battlefields.

**Feature Strategy**:

* Detail Catcher: Breaks down sound into tiny bits to capture quick changes as time passes.
* Interference Detector: Spots strange patterns that show who is trying to mess with the sound.
* Voice Checker: Listens to how a voice sounds, such as its rhythm or tone, to tell if it's a real or a fake.

**ASR/TTS Modifications**:

* Multi-modal ASR listens to both voice and vibration patterns for recognition.
* TTS with emotional resonance synthesis, adapting to urgency or context.
* Real-time reverse feedback loop to detect vocal manipulation mid-sentence.

**Part 3: Demo Scenario**

**Storyboard Concept**:

* Echo City is under siege. SoundWave calls out to activate the Vocal Grid Interface.
* “Interface non successful, external interference detected.” The interface fails due to Siren’s disruption.
* SoundWave coughs, adjusting his voice slightly—fails again.
* SoundWave is confused about his failure again, thinks back to his engineer installing the Echo Grid Engine.
* “Grid Engine, switch to back sound channel Omega-9. Cancel out Siren’s noise- DO IT NOW!” Grid recalibrates using SoundWave’s voiceprint and emotional tone.
* SoundWave shouts a command once more—the city’s resonators realign, absorbing destructive waves.

**Part 4: Executive Pitch**

* System Name: The Echo Grid
* Tagline: “Command with Confidence”
* **Key Features**:
* Separates deep and low sounds to avoid mixtures of other noises.
* Emotion-integrated modeling for further comprehension of emotion when spoken to.
* In real-time calibration to prevent any delays.
* **Competitive Advantage**:
* Unlike the average systems of our competitors in Harmonia City. The Echo Grid thrives in chaotic and resonant environments and has an impeccable understanding of emotions through tone and rhythm recognition.
* The Echo Grid is not only designed for sonic offense but also for communication.