Automated Testing of Infotainment Systems

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Introduction

At the turn of the millennium, automakers would not have used the word “smart” or “connected” as a key feature of their vehicles. However, a couple of decades later, the automotive industry is driving one of the most significant innovations in smart and connected devices with in-vehicle infotainment (IVI) units.

Spurred by the smartphone growth, the infotainment market crossed $20 B in 2021 and is expected to nearly double by 2027. The auto industry has created the Open Automotive Alliance, a group of leading automakers established in 2015 to share a vision for the connected car and who has been pushing to bring the Android platform to cars. Android is increasingly the market leader in modern automotive systems, and major automakers have shifted to or are planning to move to Android soon.
Challenges

This innovation, however, has come with its own challenges. As the auto industry becomes more softwarized and the drive-train innovations converge, connected experience has become a key buyer value. According to McKinsey’s 2020 survey on autonomous driving, connectivity, electrification, and shared mobility, 37% of consumers mentioned that they would switch car brands for improved connectivity, and 39% were interested in unlocking additional features in their vehicles. These additional features include more apps, better-connected experiences, and self-driving features.

Customers treat infotainment systems as smart devices and expect an experience on par with mobile experiences. They expect the infotainment UX to be smooth and responsive, and features like navigation, entertainment, and communication are on-par smartphones.

Replicating the user experience from production

One of the biggest challenges every software team faces is replicating the production/user issues in a test environment. Teams must replicate the production environment with telemetry variables like connection issues, user versions, signal strength, activity transitions that led to the problem, etc. Without a robust infrastructure to identify and triage the issues, the auto OEMs need to rely on support teams or dealerships to identify the variables like the last updated version of the software.
Testing in geo-distributed teams
Creating and managing a test lab is a challenge for every QA team. Infotainment systems have additional complexity as they require inputs from multiple sources like user touch, connected devices, cameras, proximity sensors, etc., and display the results on the infotainment unit. Auto OEMs and IVI app developers with distributed teams, therefore, face resource constraints.

Issues unique to IVI
While most software teams face the above problems, some challenges are unique to IVI systems. An ideal IVI system must be responsive and reliable and tackle issues like driver distraction, speed monitoring, network changes while driving, calculating approximate geolocation, and gauging drive performance.

The HeadSpin Solution
Auto OEMs and IVI app developers need an advanced test lab with cutting-edge analytics and experience monitoring capabilities that seamlessly integrates with their development platform to create a competitive advantage. HeadSpin is helping leading auto OEMs improve development quality, shorten release cycles, and create flawless digital experiences.

HeadSpin has a deep experience in smart android devices and infotainment testing. You can use HeadSpin devices in various geographic locations or create your own infotainment testing lab in the cloud. **HeadSpin’s In-Vehicle Infotainment Solution (IVIS)** applies data science and innovation to infotainment and in-cabin experience measurement enabling real-time user experience monitoring and proactive resolution of issues with the infotainment systems.

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HeadSpin’s Infotainment System Testing Solution - benefits

The HeadSpin data science platform along with the OEM system application solution is embedded into the vehicle infotainment system to get real-time user data for constant feedback and improvements across the organization.

HeadSpin helps auto OEMs improve their infotainment testing efficiency and effectiveness by providing:

Remote access to shared devices

Auto OEMs and IVI app developers can access shared devices deployed and managed by HeadSpin or create their own dedicated cloud labs deployed on-prem or in the HeadSpin cloud.

AI-based analytics

HeadSpin’s advanced AI & ML platform allows users to gain intelligent insights for accelerated product development. HeadSpin helps identify issues early, perform automated root cause analysis, provide automated regression intelligence, and identify the key performance indicators for your infotainment unit.

Digital Experience Monitoring

A system app pre-installed on the infotainment unit, continually collects the consumer device’s data, analyzes it as captured in the device, and converts it to HeadSpin metadata. HeadSpin’s cutting-edge ML identifies issues on the device and uploads only the curated debug data to the cloud to respect customer privacy. This provides valuable insights like application performance, user experience, and driver distraction. Teams can remotely and conditionally configure individual HeadSpin modules (like analysis modules, upload managers, and system modules) from the cloud to maintain control over when, where, and how monitoring is enabled on consumer devices.

HeadSpin’s Auto Testing Solution provides complete visibility into a driver’s automobile experience and enables auto OEMs and IVI app developers to improve user experience by enhancing testing efficiency and effectiveness.
Use Cases

End-to-End Phone as a key

QA teams require managing the tools and devices efficiently. A tester may be sitting in India, while the spare device may be in Germany.

A major automotive customer wanted to automate end-to-end user journeys for their mobile phone as a key application. The challenge was that the users needed to interact with the head unit after each flow physically. A blue finger device (a small electromagnetic chip) was placed in contact with the touch screen to activate a predetermined location electromagnetically to resolve the issue. HeadSpin also created a switch (a smart actuator) that triggered the controller board on command and included test bench software so that actions could be triggered on command.

These three tools enabled automating the phone as a key test case that previously required frequent manual intervention.

End-User Experience Monitoring

HeadSpin’s system app is embedded as part of the vehicle infotainment system OEM version of the Android Automotive OS. This allows HeadSpin to monitor for specific events called “session triggers”, which trigger a deeper level of experience profiling when observed. For example, if there is a UX issue regarding an unresponsive screen, the event will be captured as a part of the experience profiling.

Debug data around the user experience and system issues are asynchronously uploaded to the cloud to provide near real-time insights into consumer experiences.
HeadSpin captures real-time user experience KPIs using machine learning. Examples of data points collected include blank screens, buffering/preloading animations, rage tapping, user engagement, vehicle speed, call state, signal strength, logs and logged stack traces, user engagement, and UX restrictions.

The HeadSpin Advantage

Enable auto companies to improve user experience through proactive repairs & better service resulting in high NPS

Drive up revenue as infotainment experience is emerging as a key decision-making factor for consumers.

Unique opportunity for the auto industry to monetize data. E.g., Insurance companies can now analyze various aspects of car usage and determine accurate premiums.

With the vehicles increasingly getting digitized by the day, infotainment experiences are emerging as the key differentiator and decision-making factors for consumers, and auto OEMs and IVI app developers need to provide a smooth customer experience. HeadSpin’s innovative AI-driven platform provides a turnkey solution to create and maintain flawless digital experiences for infotainment units.