

Advanced gesture recognition technology for mobile devices — Research & Development

Client

<Undisclosed company>, a global leader in consumer electronics, home appliances and mobile communications. With over 50 years of history, the company controls over hundred local subsidiaries, several dozens factories and R&D laboratories with about 80,000 employees worldwide.

Business Need

Recent introduction of multi-touch devices has spawned a wave of interest in consumer electronics manufactures as multi-touch technology permits greatly increased user interaction on a small scaled display. Multi-touch technology represents a set of interaction techniques which allows controlling graphical user interface with more than one finger. By making a certain gesture or drawing a pattern, users of multi-touch devices are able not only to run the designated application but execute a specific task as well.

To be able to create devices equipped with multi-touch hardware, a manufacturer requires integration of the new technologies with the user interface of the device. Beyond current gestural interaction for touch screen – such as tapping, flicking and dragging - the Customer had been searching for more advanced and compound gestural interaction technology. The **advanced gesture recognition technology** was required for the Customer's new mobile device equipped with ultra-sensitive touch screen.

A local R&D Laboratory of the Customer has chosen Auriga as the contractor for one of its projects due to Auriga's significant experience in software development and testing for the embedded and mobile platforms (Java, C/C++, etc.), advanced GUI development (mobile GUI), implementation and tuning of complicated algorithms (OS kernel level, distributed algorithms, etc.).

Objectives

The project goal was to **create** an advanced Gesture Recognition (GR) framework:

- capable of **reliable recognition of ink gestures** (e.g. a tick sign),

- supporting **user-defined** (by sample) and **multi-stroke** (e.g. a dollar sign) **ink gestures**.
- optionally supporting **multi-touch manipulation gestures** (touch and rotate),

and finally, **incorporate** this framework in the existing legacy mobile platform to make them GR-aware in order to support single (e.g. drawing a dollar sign to launch the calendar) and compound gestures (e.g. select then delete to delete items).

Solution

The project development was split in two phases: **Proof of Concept** and **Production**. The proof of concept phase resulted in the GR Core prototype. The production phase included GR Core finalizing, its integration into the GUI framework and applications update.

The project was not a fully-fledged research effort to workout a new GR algorithm; instead of this a proper GR algorithm was chosen from a set of existing algorithms, and then adjusted and tuned to increase the recognition reliability. Gesture Recognition Algorithms were selected and tailored on the basis of an open-source solutions available, including a well-thought-through algorithm for recognition of compound gestures.

Eventually, Auriga engineers developed a **Manipulation Gesture Recognition platform**. This cross-platform, device-agnostic, multi-touch gesture recognition framework consists of the following components:

- **Gesture Server** is the main piece of the application. It handles gesture processing and passes touch points and/or gesture information to the client application. The Gesture Server supports manipulation gestures (such as drag, scale, rotate, etc.) and is extensible to support an infinite number of user-written custom gestures.
- **GR Engine** is the component that actually recognizes gestures. It comprises Ink gesture recognition (by sample) performed by GR Algorithm and Multi-touch manipulation gesture recognition.
- **GR monitoring and control tools** are responsible for

configuring, tuning and monitoring the GR engine.

- **GUI Framework** is enhanced to support gesture recognition, including:
 - seamless integration of the GR features with existing touch screen functionality
 - providing a new Gesture Recognition API to the GUI applications, including multi-touch support
- **TouchScreen Driver** and set of **user applications** were updated to become GR optimized and multi-touch aware.

The Customer appreciated the exceptional recognition reliability, seamless integration with GUI and ink and manipulation gestures co-existence of the delivered solution, achieved by Auriga engineers.

Tools and Technologies

- iGesture
- Sparsh-UI
- AME pattern library, Grafiti framework
- Java, Java ME