

Infrastructure developing to meet demand for location based services

Growing demand for a range of location-aware applications indoors as well as outdoors will mean increased use of inertial sensors and pressure for more reliable location information.

“Augmented reality has potential to be much more useful than just advertisements and offers,” explains Kanwar Chadha, CSR

But the infrastructure still has a ways to go to make the systems more accurate, the apps easier to develop, and the business models worked out for how to monetize the services in ways that customers find compelling.

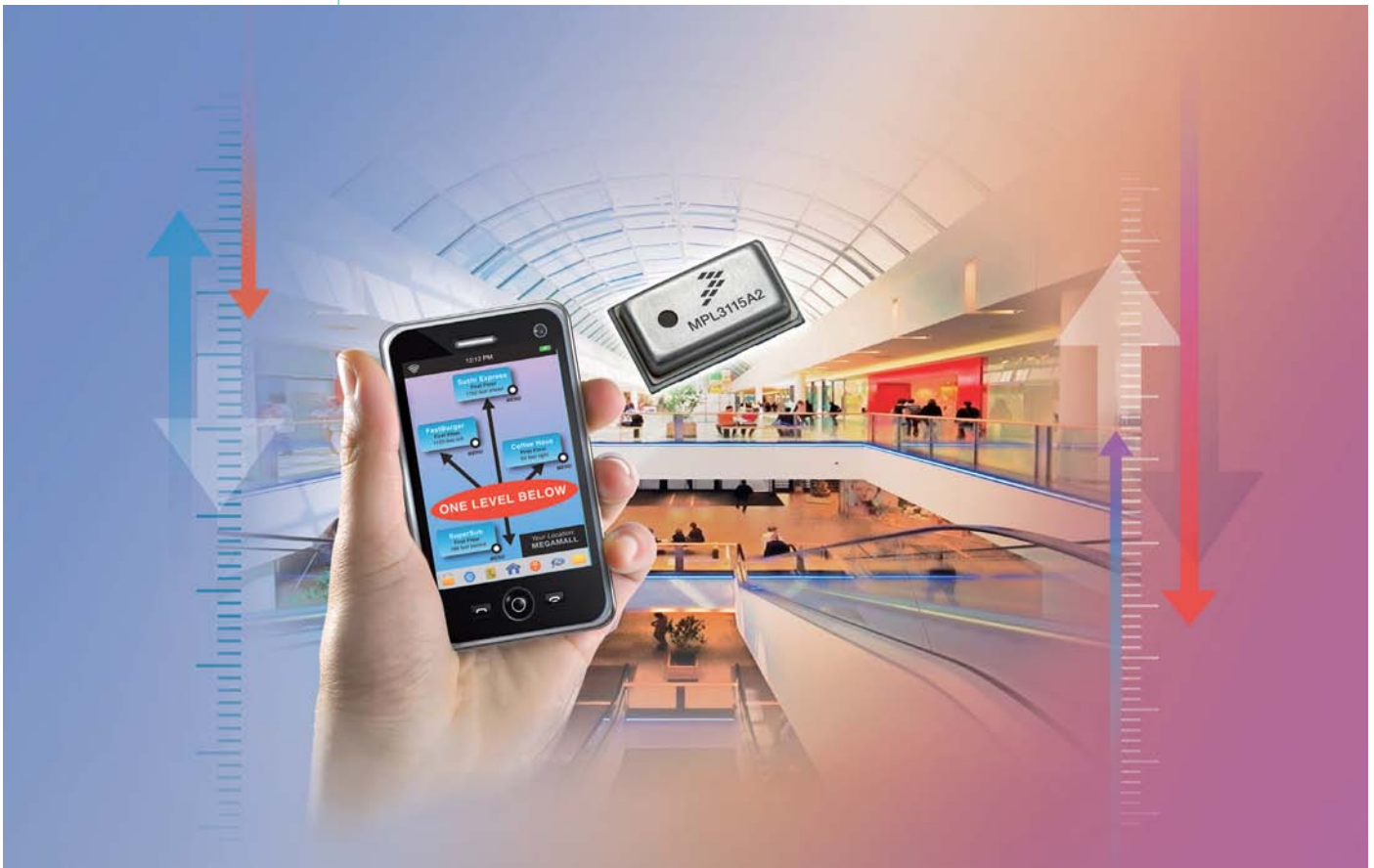
GPS chipset maker CSR sees strong pull for inertial sensors from location-aware searches

The driver for location-based services will not be new applications, but local enhancement for all the things we already do, argues Kanwar Chadha, CSR chief marketing officer, pointing to the usefulness of localized search, for finding things like the lowest nearby gasoline price on the Gas Buddy app, or for finding nearby restaurants taking reservations on the Open Table app.

Though these services will be monetized by local ads, they'll also need to do more than just push ads

or coupons at consumers to succeed. “New apps are starting to take a more intelligent view of what the consumer wants instead of just pushing things at him,” he says, noting the need for aggregators to supply information or offers from more than just one merchant per app, organized around search topics like Open Table, or around the recommendations of people you know, like Facebook.

Customers are asking CRS particularly for reliable pedestrian navigation combining outdoor and indoor maps, for point of interest information nearby, for alerts of who is around for social networking, for augmented reality to gather information beyond just what one can see, and for tracking business assets, children and pets, indoors and out. And for precision and ease of use, that of course requires not only accelerometers and magnetometers, but also gyros for precise extrapolation of location, and pressure sensors to seamlessly identify the floors indoors, where most of the advertisers will be. Though



Freescale Xtrinsic MPL3115A2 pressure sensor (Courtesy of Freescale)

less critical than before with smarter power management of GPS systems, MEMS sensors are still needed to reduce power consumption of continuous searching for the GPS or wireless signal, with even such simple solutions as using the accelerometer to tell when the unit is not moving, so there's no point in searching for a signal.

Currently, says Chadha, most consumer-grade inertial sensors are not optimized for location applications, so the MEMS suppliers who will win in this market will be those who can offer products with less drift for more accurate dead reckoning, as well as low power operation, small size and low cost. He figures MEMS suppliers need to integrate the sensor-level information from the multiple MEMS sensors, but argues the GPS engine maker can best do the rest of the signal integration and management. "From our perspective, since GNSS [global navigation satellite systems] is primary, we have a better view of the system, and we can combine signals from satellite, radio and sensors for the best solution," he argues, suggesting that any window of opportunity for middle level solutions suppliers will likely be only temporary.

Before developers can create the location-aware applications to drive this demand, however, the infrastructure needs further development.

The first issue: most systems aren't nearly accurate enough yet for most locating applications beyond automotive navigation. Though accuracy now ranges from 5-50 meters, indoor applications need widely available and reliable accuracy of better than 10 meters in all sorts of locations with limited signal availability, and some applications will need better than 1 meter. Then the GPS makers will need to provide a platform that specifies the quality of service needed for various types of application. While social network alerts don't need to be very accurate, for example, driving applications need to tell you if they are not accurate instead of telling you the wrong information. Finally, operating systems makers Google, Apple and Microsoft will need to provide more intelligent APIs that can be easily used by developers for location applications.

Map maker Point Inside notes that indoor maps help improve accuracy

From his position on the front line of building applications for customers using its digital maps of major indoor locations, Point Inside



CSR's SiRFstarIV GPS powers location awareness in new Samsung Galaxy S II smartphone (Courtesy of CSR)

CEO Josh Marti notes that inertial sensors are vital, but information from the map and the retailer also help make indoor location much more accurate. The apps can sometimes get absolute initial location by simply asking the user to indicate their position on the map, algorithms can limit movement to aisles, and retailers may know item location accurately enough to locate the user within about four feet when he scans a product. "The map will be mandatory for dead reckoning," he argues. "Even sensors need help."

The position technologists at the three-year-old startup have focused on mapping the leading US consumer destinations -- big box stores, shopping malls and airports—which account for by far the largest volume of consumer visits a year. Point Inside builds apps for retailers that enable customers to search and locate products in the store, using information from the retailer's data base, and can send offers to the consumer's smart phone customized to what's nearby at that microlocation. The company also makes a free Android app for shoppers for searching for a particular product at a mall.

Marti argues that both gyros and pressure sensors, as well of course as the more common accelerometers and magnetometers, will be vital for useful indoor positioning and navigation systems. Adding a gyro significantly improves precision, by helping distinguishing steps from hand movements to improve step counting, and by reacting quickly to more accurately account for to changes in direction. Pressure sensors will be needed to distinguish different floors in a building, without the user having to do the busy work of changing the

level. "The additional sensors are really all about convenience and ease of use, not really utility," notes Marti.

But the infrastructure to ease applications development is still limited. Point Inside has been partnering with sensor makers and doing some of its own sensor fusion to improve accuracy. But the gulf between the app developers and the MEMS makers looms frustratingly large. "There needs to be a better way to connect the app developers with the sensor hardware guys," he suggests. "Now it's only Apple and Google who are doing this, which is unfortunate because a lot of the great ideas come from two guys in a garage without any access to the hardware." Eventually the Android operating system will likely add APIs that ease the sensor fusion task, but until then it's a problem for developers.

While advertisers are definitely interested in the potential of reaching specific customers in specific places and tracking the results, it's still a little unclear who's going to deliver these ads to consumers.

Stores want to own and control their brands, but are not likely to want to download apps merchant by merchant. Conveniently, it turns out that getting consumer feedback on what does work in this emerging field is surprisingly easy, as people are quite willing to text their feedback after trying these location-based searches and offers. Marti says PointInside gets extensive free-form text feedback from users who are explicit about what they like and what they don't, opening the possibility of a customizing algorithms that are useful to consumers.

Sensor maker Freescale sees strong pull for inertial-aided locating, need for distributed processing

"Location-based services are a key request we get from retailers and telecoms," concurs says Freescale Semiconductor's Stéphane Gervais-Ducouret, worldwide marketing manager for consumer and industrial sensors. "It offers real ROI on advertising to pinpoint customers, locations, and items very precisely. We get many requests for this."

He cites the example of Groupon's new Groupon Now service giving location-based service a dose of high profile credibility in offering discounts for particular hours at nearby restaurants or activities to users who click "I'm hungry" or "I'm bored," and usefully offering merchants a way to use discounts to fill the seats just when things are slow.

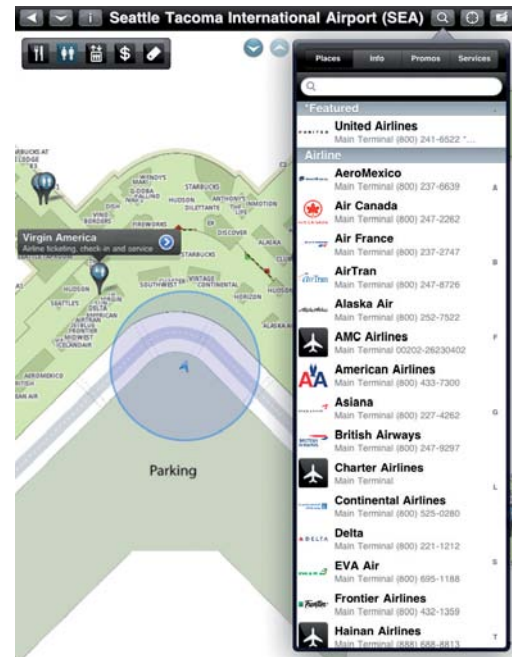
But these services need better locating accuracy and reduced power consumption for wide acceptance, which means they need inertial sensors. Gervais-Ducouret figures the pressure sensor will increasingly be necessary for pedestrian applications, to differentiate levels as well as to improve the accuracy of distance calculations by adjusting for hills and stairs. Freescale just introduced a pressure sensor targeted specifically at consumer applications, with what it says is accuracy of 30 cm.

Another key issue, he argues, is distributed processing of data from multiple sensors at the sensor level, to help take much of the load off the central processor compared to locating by GPS or wifi. Freescale's solution for sensor-level signal integration is to package a microcontroller with the accelerometer, to manage the data from the accelerometer and the magnetometer, to send the application processor a heading instead of just the raw data, reducing the data sent by 20x, and using only a few microwatts of power instead of 100 microwatts of the central processor.

He concurs that more complex parts of this distributed processing will likely be done at GPS chip or chip set makers with navigation expertise.

Augmented reality will take longer to develop

Local retailers have shown the most interested in investing in augmented reality, to be able to reach out to deliver information or discounts on their offerings directly to consumers who are right there right now, and to be able to track the results. But Point Inside's Marti suggests these that most people expect will not actually be the first successful applications of augmented reality. There's often not enough room between the user and the objects, and not enough accuracy in the location or the sensing, to overlay



PointInside iPad Airport MyLocation (Courtesy of Point Inside)

information on objects in interior microlocations. "Our partners always ask, but we tell them users won't appreciate the experience," he notes. What may be more viable, he suggests, is overlaying interactive graphics on objects to engage or inform the consumer, making, say, a bunny appear to jump out of the cereal box and run off. These would rely on the image sensor to recognize the box to initialize the interaction, and would use motion sensors to allow the phone to pan the image.

TI's Brian Carlson, OMAP product manager, concurs that most user and developer interest is in ways to bring a newspaper ad or a poster to life by having it play video. Other eventual examples could be pointing at a book in the store to see its reviews, or, better still, pointing at IKEA furniture parts to get clear assembly instructions. "Once people see it, it'll be viral," he says. "They'll expect it."

Augmented reality has potential to be much more useful than just advertisements and offers, also argues CSR's Chada, who suggests the compelling application will be letting people extend their vision to see what's ahead, to make driving safer by showing what's ahead over the hill or around the corner.

But more issues remain here. Location technology needs to be much more accurate for many of these potential applications. The kind of high quality 3D graphics and video to make some of these interactive applications compelling remain expensive to develop and too power hungry to be practical in handhelds. Better development tools will be needed, as well as effective business models to pay for the development. Carlson suggests more applications may start to appear in about two years.

Paula Doe for Yole Développement



Kanwar Chadha,
Chief Marketing Officer, CSR plc
Mr Chadha joined CSR on 26 June 2009 following

the acquisition of SiRF Technology Holdings Inc., where he was a founder, vice president of marketing, and a member of the board of directors. Chadha has more than 25 years of experience in various marketing and management positions. Prior to founding SiRF, Chadha served as general manager of the Multimedia Group and director of strategic marketing at S3 Inc., where he led the development of innovative audio and video processing technologies.



Stéphane Gervais-Ducouret,
global marketing, Freescale
He has 19 years of

experience in the semiconductor industry as global marketing, business development, project management, and product designer. He has worked for multinational companies in Europe and in Asia in the consumer and mobile phone segments. Stéphane also has experience in emerging technologies and markets. His current position is global marketing for sensors at Freescale semiconductor and he is focusing on consumer and mobile phone market development.



Josh Marti,
CEO, Point Inside
Mr. Marti has a proven record of designing, developing and bringing to market cutting-edge technology products.

While at Qualcomm Mr. Marti helped design Qualcomm's LBS infrastructure products, and was responsible for implementations at Verizon, Sprint, China Unicom and many other wireless carriers around the world. He was also instrumental in creating and launching commercial wireless applications for such notable brands as Major League Baseball and the Universal Music Group. Mr. Marti has a B.S. in Electrical Engineering from Seattle University.