THE HONG KONG POLYTECHNIC UNIVERSITY
香港理工大學

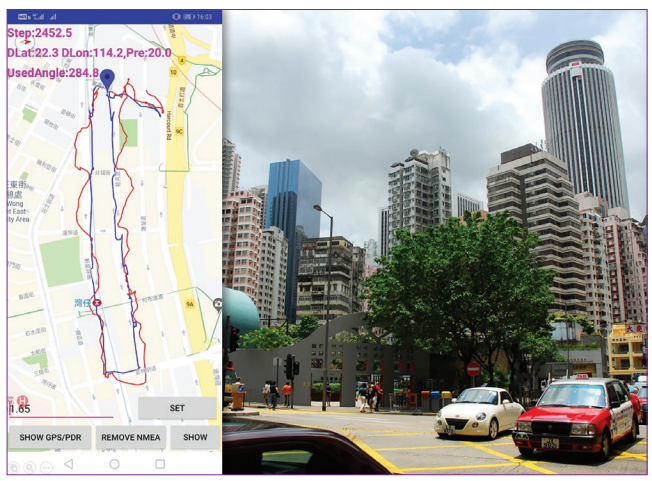
城市無縫定位系統
Seamless Urban Navigation System

利用多系統集成技術提高室內外定位精準度
Improve indoor and outdoor positioning performance and accuracy through multiple sensor integration

全球衛星導航系統(GNSS)是重要的基礎設施，是全球經濟發展的命脈。然而，在密集市區，由於信號遮擋和多徑效應的影響，GNSS的定位誤差可達數百米，這對智慧城市的發展構成嚴重的障礙。

本系統應用了我們於GNSS方面的研究成果，以多系統集成技術解決上述定位難題。系統結合來自GPS、北斗、GLONASS、Galileo 等多種GNSS的信號，從而提高戶外定位的精準度，並利用新的融合算法和信號多徑模型減少系統錯誤和系統間的差異。配合三維城市模型，系統能修正測量的距離，方便應用到其他高樓密集的地方。此外，它亦能與多種內置手機傳感器(如陀螺儀、加速度計、磁力計、慣性測量單元、計步器等)融合，以提供準確的室內定位。

多徑效應是由於信號反射到建築物或其他表面上而引起，會增加定位誤差
The multipath effect is caused by signals reflecting on buildings or other surfaces, and will lead to wrong measurements and inaccuracy



於灣仔進行的行人定位測試：城市無縫定位系統(藍線)的精確度遠比智能手機(紅線)為高
Pedestrian positioning test in Wanchai: The seamless urban navigation system (blue lines) yields far more accurate results than a smartphone (red lines)

專利編號：201010273220.3 (中國), ZL201410663210.9(中國), ZL201410027297.0 (中國)

特色與優點

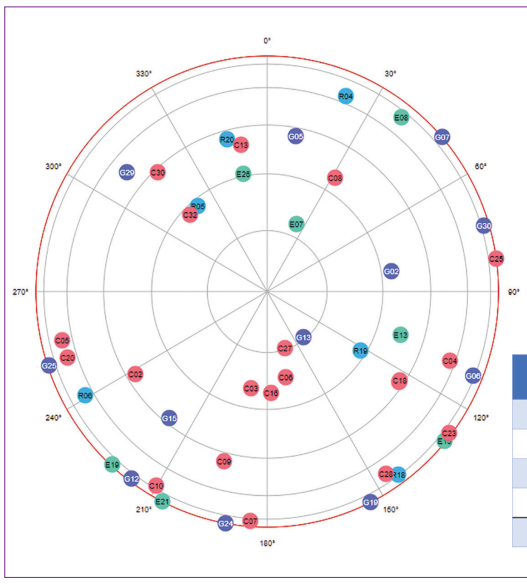
- 減少城市環境GNSS多徑效應的影響，提高定位精度。室外定位準確度在10米之內，而室內定位準確度則達米計級別
- 融合多種手機內置傳感器，無需配置額外硬件設備，亦可提高手機GPS 技術的定位精度及效率

應　用

- 城市導航
- 智慧城市發展
- 無人駕駛發展

獎　項

香港智慧城市大獎2018 - 智慧出行 (2018年6月)



GNSS systems	Count	Color index
GPS	12	G00
Beidou	19	C00
GLONASS	6	R00
Galileo	7	E00
Total	44	

香港的衛星星空圖，系統融合了多個全球衛星導航系統(GNSS)的數據
Sky plot of all satellite over Hong Kong, the system integrates the data from multiple Global Navigation Satellite System (GNSS)

Patent No.: 201010273220.3 (China), ZL201410663210.9(China), ZL201410027297.0 (China)

Global Navigation Satellite System (GNSS) is an important infrastructure in global economic growth. However, due to signal occlusion and multipath effects in dense urban areas, the error of positioning can be as much as several hundred meters, hindering the development of smart cities.

Applying our research outcomes in GNSS, this system can solve urban positioning problem via multiple system integration. It integrates the data from different GNSS (e.g. GPS, Beidou, GLONASS and Galileo) to provide outdoor positioning with high accuracy, and utilizes our positioning algorithms and models can mitigate systematic errors and inter-system differences. With the use of 3D city models, it can correct the measurements of distance and apply to dense urban areas. Besides, it can also work with smartphone built-in sensors (e.g. gyroscope, accelerometer, magnetometer, inertia measurement unit and step counter) to provide accurate indoor positioning.

Special Features and Advantages

- Mitigates multipath effects to provide outdoor positioning with high accuracy of within 10 metres and indoor positioning with meter-level accuracy
- Integrates with smartphone built-in sensors to improve the accuracy and effectiveness of positioning without the need of extra hardware

Applications

- Navigation
- Smart city development
- Development of self-driving cars

Award

Hong Kong Smart City Awards 2018 in Smart Mobility (Jun 2018)

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