自主移動機器人之實時視覺定位及不確定性估測系統

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http://www.me.ntu.edu.tw/main.php?mod=adv_custom_page&func=show_page&site_id=0&page_id=207 http://140.112.14.7/~kangli1234/IVMechatronics/

市場及需求:
傳統自主移動機器人通常依賴於二維光學雷達，但是在許多情況下，例如走廊，二維光學雷達無法獲得足夠的特徵或地標進行定位。而相機可以獲取不同的特徵，例如告示板、水管、燈，甚至是遠方的消失點。這些　特徵是建築物與生俱來的，並且是有用的定位特徵。因此，添加相機功能將是提高定位性能的合理方法。另外，自動駕駛汽車通常是利用三維光學雷達或 GPS/GNSS 來定位。儘管基於三維光學雷達的定位算法可提供準確的定位結果，但光達在實際應用中會遇到初始位置問題（或全局定位問題）、綁架問題、高計算成本和高成本。

技術摘要(含成果):
1. 提出了一套實時智慧型載具視覺定位系統，訓練卷積神經網絡，以在端到端學習中從單個 RGB 圖像估計智能載具的姿態和不確定性。
2. 本系統旨在為室內與室外應用提供低成本、可靠、實時且準確的解決方案，通過可用於嵌入式視覺應用的高校輕巧的深度卷積神經網絡來實現。

優勢:
本方法不需依靠高成本的光學雷達，只需依靠簡易的單目相機可達到優良的定位效果。通過實驗驗證，在室外精度約為 1.74m 和 7.01°，而在室內，精度則為 0.7m 和 9.27°。

競爭產品:
OMRON -- HD-1500 Autonomous Mobile Robot

專利現況:
(1)本研究團隊具有十年研究經驗，主要研究包含智能化電動車與自動駕駛技術、車輛即時控制系統、XiL 虛擬驗證技術、液壓伺服控制、結構混合模擬技術及太陽能系統研發。

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Autonomous Mobile Robot Real-Time Visual Localization and Uncertainty Estimation system

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Experience:

http://www.me.ntu.edu.tw/main.php?mod=adv_custom_page&func=show_page&site_id=0&page_id=207 http://140.112.14.7/~kangli1234/IVMechatronics/

Market Needs:

AMRs often rely on two-dimensional light detection and ranging (2D LiDAR). However, in many scenarios, such as corridors, the 2D LiDAR cannot get enough features or landmarks to localize. Alternatively, the camera can obtain different features, such as notice boards, pipes, ceiling lights, and even the vanishing lines. These features are born with the building and are useful features for localization. Thus, adding camera features will be a reasonable idea to improve localization performance. Self-driving cars often depend on the three-dimensional light detection and ranging (3D LiDAR) or GPS/GNSS. Although 3D LiDAR-based localization algorithms offer accurate localization results, they suffer from the initial pose problem (or global localization problem), kidnapped problem, high computation costs, and high costs during real applications.

Our Technology:

1. Propose a real-time autonomous intelligent vehicle visual localization system, that trains a convolutional neural network to estimate the intelligent vehicles' pose and the uncertainty from a single RGB image in an end-to end learning system.
2. The system aims to provide a low-coist, robust, real-time, and accurate solution for indoor and outdoor applications. The syetem is achieved by using an efficient and lightweight deep convolutional neural network for embdded vision applications.

Strength:

This method does not need to rely on high-cost LiDAR, and only needs a monocular camera to achieve an excellent positioning effect. The proposed system is verified through experiments. It achieves approximately1.74m and 7.01° accuracy for large scale outdoor scenes and 0.31m and 9.27° accuracy indoors.

Competing Products:

OMRON -- HD-1500 Autonomous Mobile Robot

Intellectual Properties:

(1) Our research team has ten years of researching experience. Our main research project contains autonomous driving technologies, real-time vehicle control systems, virtual validation technologies, hydraulic servo control, hybrid simulation platform, and solor energy systems

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