An indoor three-dimensional space positioning system

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介紹：

在工業化快速發展的背景下，智能搬運機械已成為各行業生產中的通用設備。它的外觀和應用在節省成本和改善各個行業的產品質量方面起著重要作用，可以被譽為工業生產的革命。隨著全球肺炎流行的蔓延，特別是在流行高峰期間，一線人員的工作忙碌而混亂，不幸的是，死於該流行病。在這種環境下，我們設計了一個室內三維定位系統，以解決無人機無法在室內攜帶的難題，這樣無人機也可以用於疾病預防和控制。定位系統可幫助無人機在流行期間為人們服務，從而降低了人們交叉感染的風險。節省人工成本，提高工作效率。

方法：

該系統可以分為兩部分，即發送和接收系統以及信息數據處理系統。發射器和接收器設計為以環形發送和接收超聲波。信息數據處理系統計算並定位檢測到的數據。

在平面坐標中，四個點 A，B，C 和 D 的坐標是已知的，而移動點 P 的坐標是未知的，但是到三個點 ABC 的距離是已知的，並且在這四個距離中的每一個。這四個圓的交點是點 P 的坐標。在實際應用中，四個 A，B，C 和 D 固定在坐標上，並安裝了超聲波接收電路，而 P 點將超聲波發送到周圍，超聲波從 P 點開始到固定點 A，B，C 和 D。每一個都不同。距離越遠，接收時間越長。根據室溫下聲波的傳播速度約為 340 m / s，可以將聲波傳播的時間和速度相乘以獲得每個距離。依靠四個圓在一個點相遇的原理，可以獲得移動點 P 的位置，並使用大氣壓檢測裝置檢測無人機的高度，可以獲得無人機的三維位置。通過信息

數據處理系統進行計算。

討論：

選擇檢測方案，方案一：使用無線電波測量從無人機到接收器的直線距離。選項 2：使用超聲波測量從無人機到接收器的直線距離。解決方案 3：使用超聲波測量從無人機到接收器的直線距離。最後，我們選擇第二個選項，因為上述其他解決方案由於其在室內的速度而難以檢測，並且超聲波速度為 340 m / s，遠低於其他解決方案的波速。在室內測量時，由於其速度較低，誤差也將逐個降低，因此我們選擇了選項 2。

高度測量程序的選擇，程序一：使用氣壓檢測儀進行測量。選項 2：使用超聲波進行測量。最後，我們選擇使用大氣壓檢測器來消除由於超聲波而使人在被測表面上經過而造成的誤差，並且由於大氣壓測量的穩定性，因此我們選擇了選項 1。

結論：鑑於新型冠狀病毒感染鏈的“人對人傳播”特徵，遏制這種流行病的理想方法是從避免與人接觸開始。該設計將使用三維定位來協助無人機的工作，並使無人機不受室內地形的限制，從而減少與人接觸的機會。而且，使用該系統可以進一步利用室內空間，以減少地面機器人所造成的空間浪費。

Introduction:

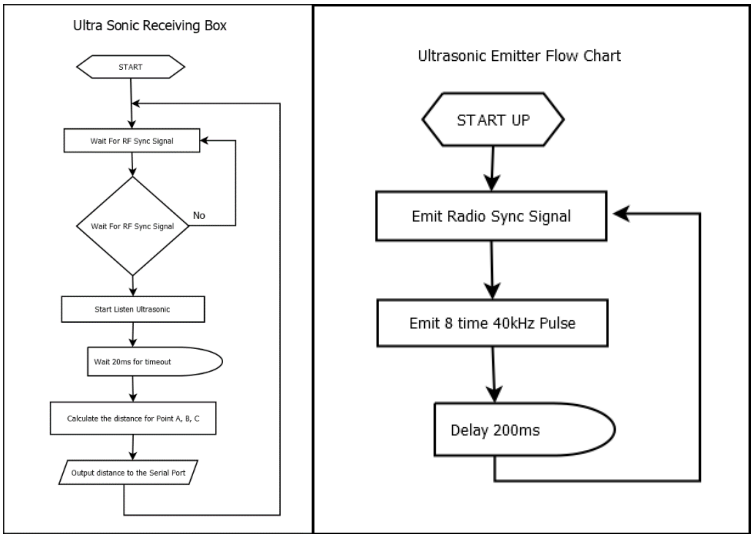
In the context of the rapid development of industrialization, intelligent handling machinery has become a piece of common equipment in the production of various industries. Its appearance and application have played an important role in saving costs and improving product quality in various industries and can be hailed as a revolution in industrial production. With the spread of the global pneumonia epidemic, especially during the peak period of the epidemic, the work of the

frontline personnel was busy and chaotic, and some, unfortunately, died of the epidemic. In this environment, we designed an indoor three-dimensional positioning system to solve the previous dilemma that UAVs could not be carried indoors so that UAVs can also be used for disease prevention and control. The positioning system assists the drone to work for people during the epidemic, reducing the risk of cross-infection of people. Save labor costs and improve work efficiency.

Methods:

This system can be divided into two parts, namely the sending and receiving system, and the information data processing system. The transmitter and receiver are designed to send and receive ultrasounds in a ring shape. The information data processing system calculates and locates the detected data.

In the plane coordinates, the coordinates of the four points A, B, C, and D are known, and the coordinates of the moving point P are unknown, but the distance to the three points ABC is known, and four circles are drawn at each of these four distances. The intersection of these four circles is the coordinate of point P. In practical applications, the four A, B, C, and D are fixed on the coordinates and the ultrasonic receiving circuit is installed, while the P point transmits ultrasounds to the surroundings, and the ultrasounds starts from the P point to the fixed points A, B, C, and D. Each is different. The farther the distance, the longer the receiving time. According to the sound wave propagation at room temperature is about 340 m/s, the sound wave propagation time and speed can be multiplied to obtain each distance. Relying on the principle that the four circles meet at one point, the seat of the moving point P can be obtained and use the atmospheric pressure detection device to detect the altitude of the drone, and the three-dimensional position of the drone can be obtained through the information data processing system calculations.



Discussion:

Selection of detection scheme, scheme one: uses radio waves to measure the straight-line distance from the drone to the receiver. Option 2: Use ultrasonic to measure the straight-line distance from the drone to the receiver. Solution 3: Use ultrasonic to measure the straight-line distance from the drone to the receiver. In the end, we chose the second option, because the other solutions mentioned above will have difficulty in detection due to their speed indoors, and the ultrasonic velocity is 340 m/s, which is much lower than the wave velocity of the other solutions. When measuring indoors, the error will also be individually low due to its low speed, so we chose option 2.

Altitude measurement program selection, program one: use atmospheric pressure detector to measure. Option 2: Use ultrasounds to measure. In the end, we chose to use an atmospheric pressure detector to eliminate errors caused by people passing by on the surface of the measured surface using ultrasounds, and because of the stability of atmospheric pressure measurement, so we chose option 1.

Conclusion: In view of the "person-to-person transmission" characteristics of the

novel coronavirus infection chain, the ideal way to contain this epidemic is to start by avoiding human contact. The design will use three-dimensional positioning to assist the UAV's work and make the UAV not restricted by terrain indoors, thereby reducing the chance of contact with people. And the use of this system can further use the indoor space to reduce the waste of space caused using ground-borne robots.

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