

解放你的雙手

飲水機 智慧偵測 停水裝置

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自動機



需要按三個按鍵

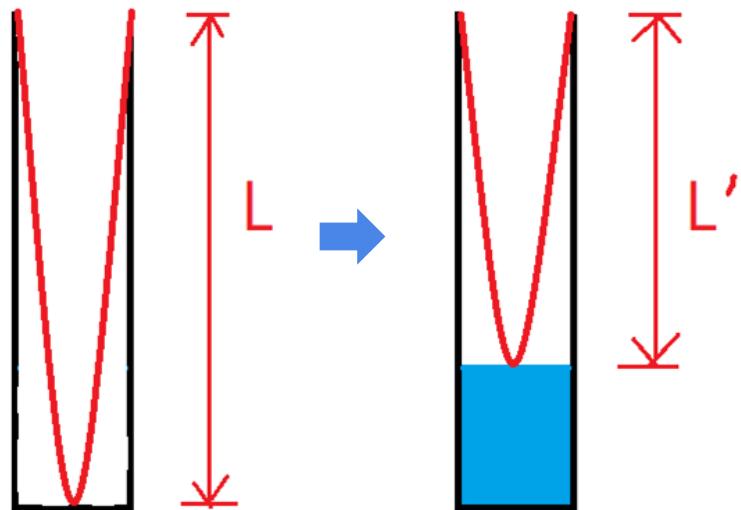
需要注意水何時裝滿

→ 麻煩!

目標

設計出能夠偵測水量並自動停水的裝置

設計方式 - 基礎原理(空氣柱共振)

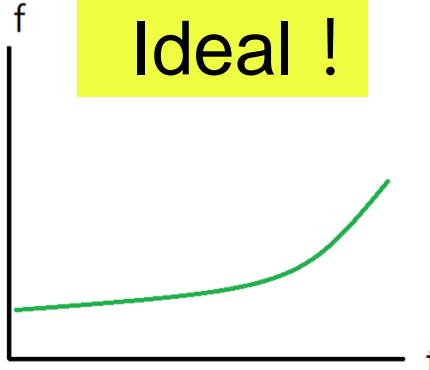


$$v = 331 + 0.6 * t \approx 340 \text{ (m/s)}$$

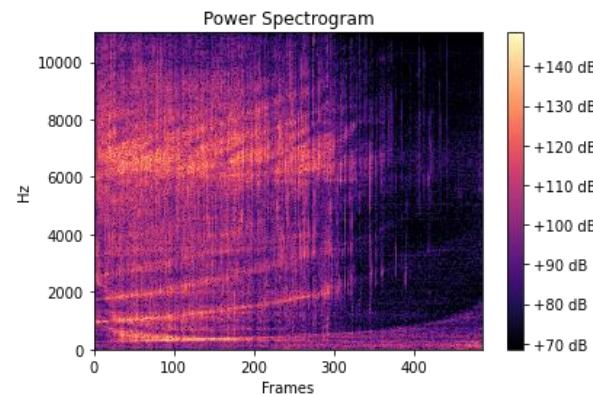
$$v = f * \lambda$$

$$L = 23 \text{ (cm)} \Rightarrow \lambda = L * 4 = 0.92 \text{ (m)}$$

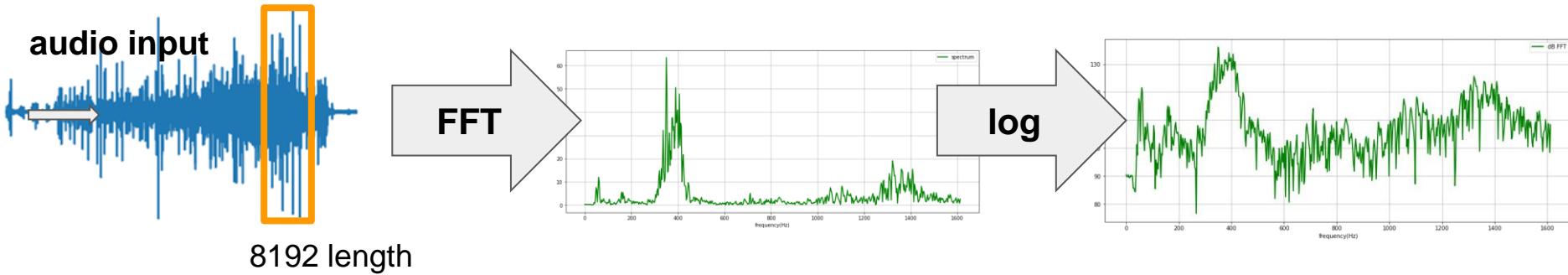
$$f = v / \lambda = 370 \text{ (m/s)}$$



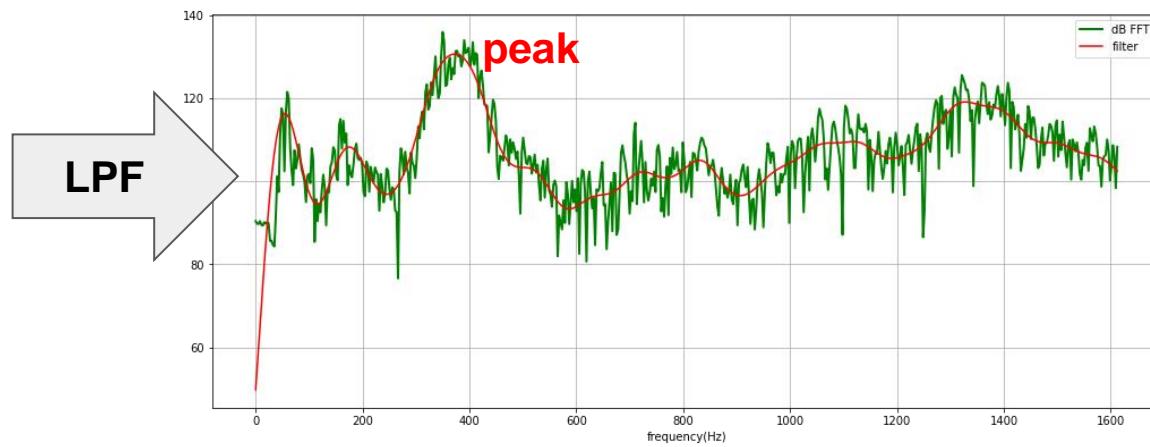
Ideal !



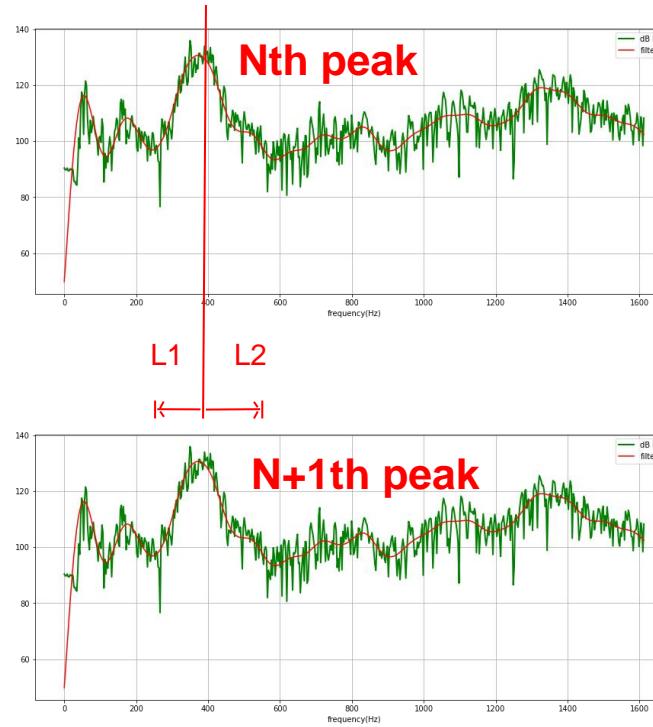
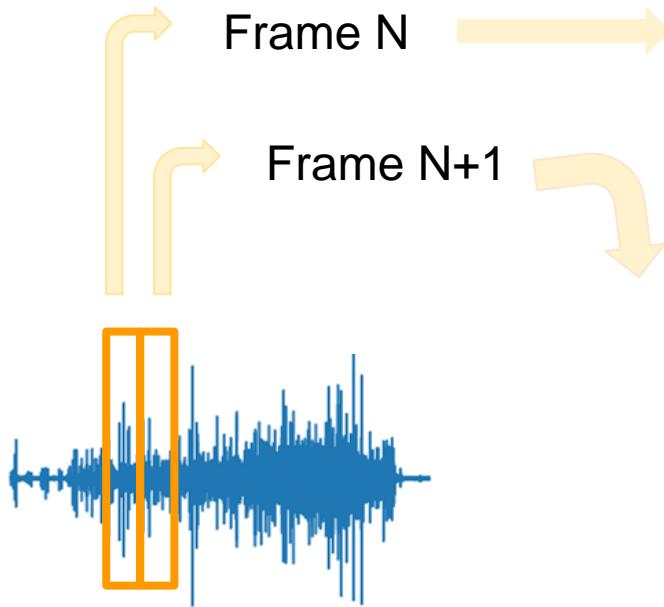
設計方式 - 基頻的偵測



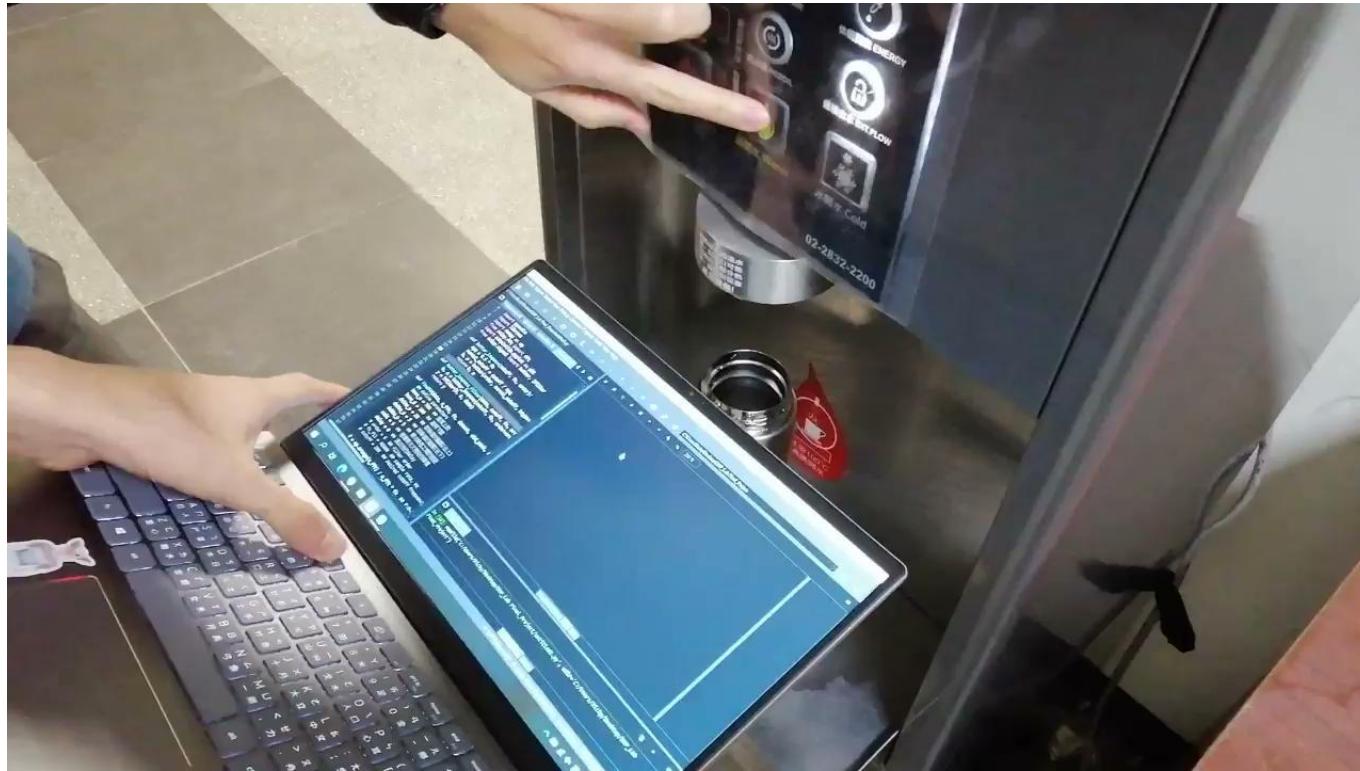
8192 length



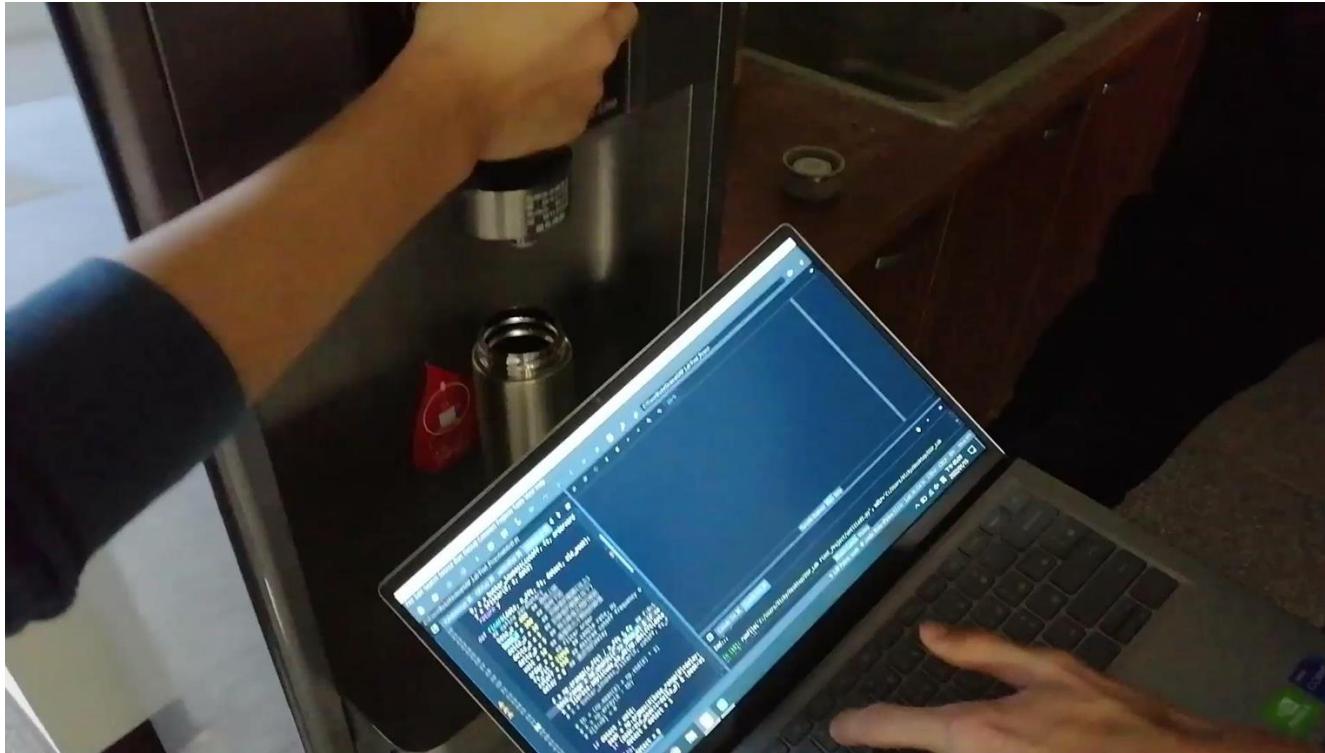
設計方式 - peak 的交叉驗證



成果影片 Demo1



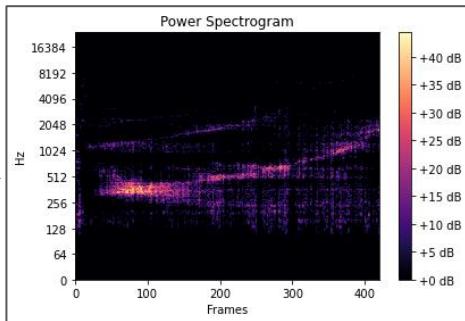
成果影片 Demo2



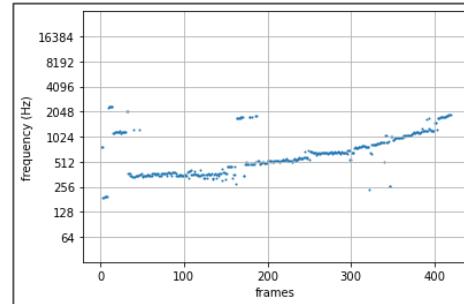
理想-實際-預測 頻率峰值比較

Audio

時頻譜

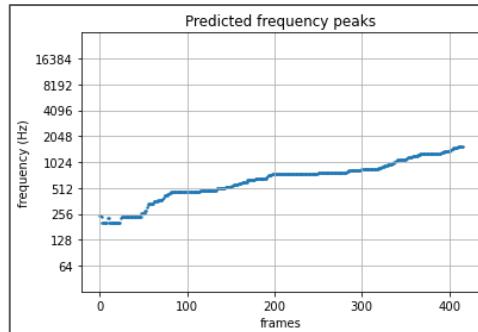


對每個frame取peak

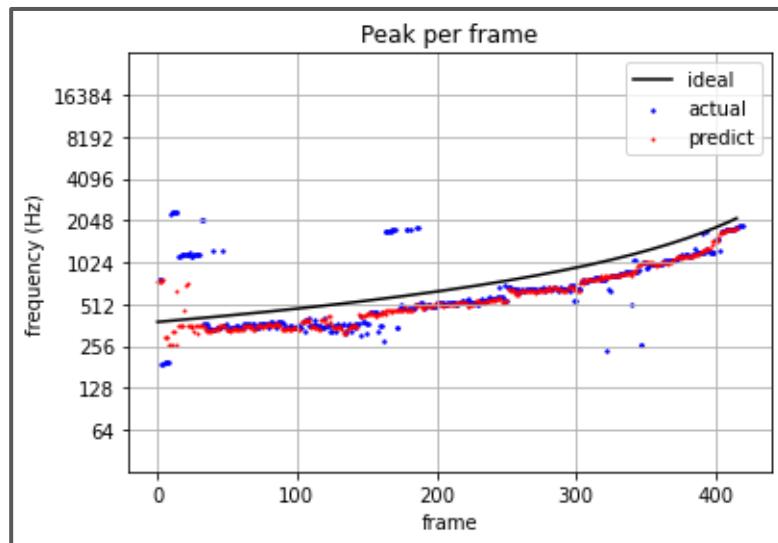


actual

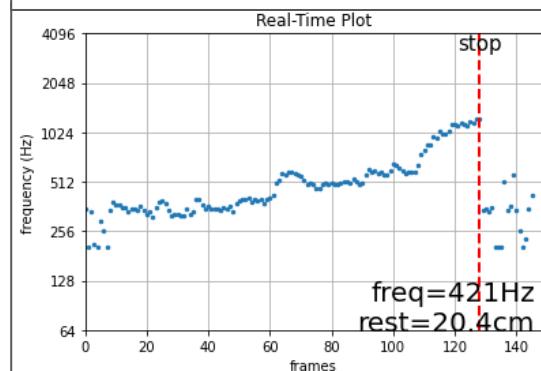
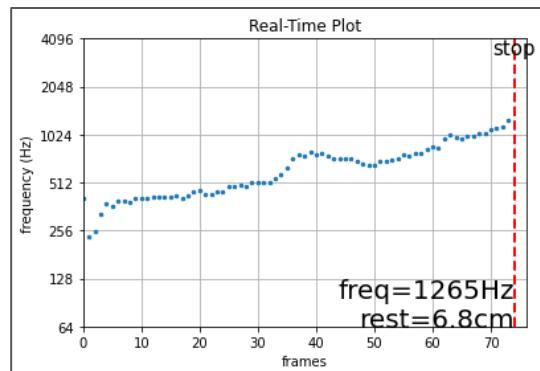
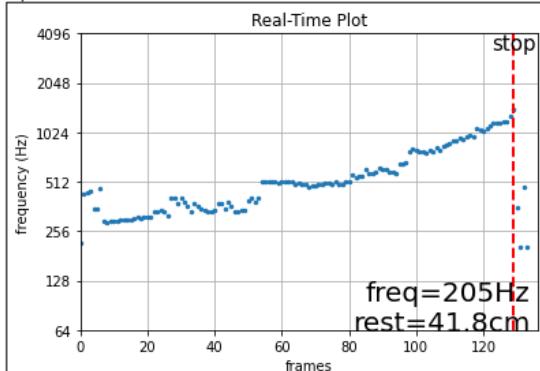
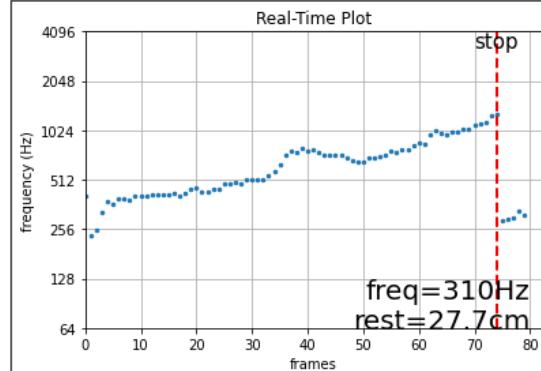
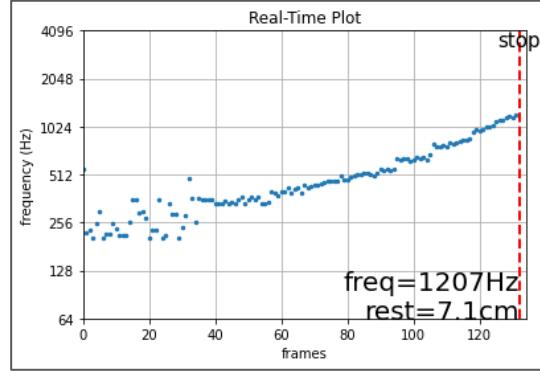
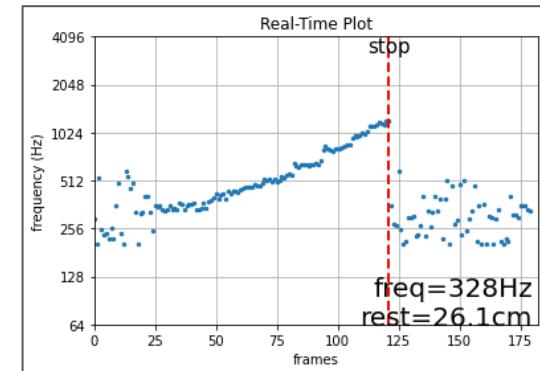
用我們的演算法預測peak



predict



結果與數據展示



結論

實驗成果總結：

找出基頻所在

Real-Time Display

水裝滿時發出終止提示

適用於不同瓶身

適用於少量噪音的環境
(如教室走廊、體育室)

研究意義所在：

省掉按各種按鍵的麻煩

減少接觸達到防疫效果

以自動化替代人力的開端

未來發展方向：

找基頻更加精準

降低雜訊

飲水機訊號放大

配合飲水機調控出水量

感謝聆聽！