

## 國立臺灣大學技術行銷表

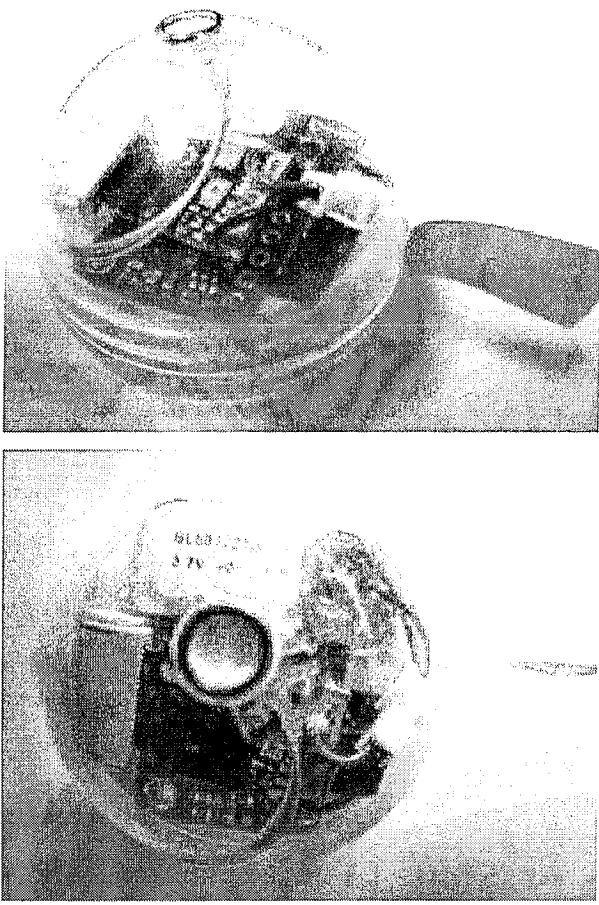
台大案號: \_\_\_\_\_ (由產學合作中心填寫)

產學合作中心聯絡人:

電話:

e-mail:

產品/技術名稱	水管管路探測器
發明人/單位	朱浩華、賴宗德、陳予涵 (臺灣大學資工)、黃寶儀 (臺灣大學電機)
產品/技術說明	<p>老舊房屋重新裝修時因缺乏建造當初的管線配置架構圖而使得得知水管管線配置成為惱人的問題，而現今唯一的解決方式為將牆壁拆除以重建出建築物的水管配置。建築物漏水的情形經常發生於水管與水管間的連結處，若能建構出水管的管線配置，可對其位置做粗略的估計並更精確的找出漏水的位置。</p> <p>基於以上「水管管線架構」的重要性，本產品一個公分-scale 的球體探測器由入水孔處置於水管內流動，利用水管管線中自然流動力在流動過程中連續地蒐集水壓以及陀螺儀的讀數。於出水口取出探測器後，分析壓力、陀螺儀的讀數並以演算法重建出曾流經的水管管線配置架構。</p>
應用範圍	任何需重建水管管線配置的建築物或空間
產品/技術優勢	<ol style="list-style-type: none"> <li>1. 水管管路探測器以完全不破壞建築物及不侵擾環境的方式準確地重建水管管線架構，與傳統的暴力拆除牆壁方是有極大的不同。</li> <li>2. 水管管路探測器的流動不需任何發動能量，而是使用水管管線內部的自然驅動力，因此僅需 15 毫安培即可以每秒 15 公分的速度航行一公里。</li> <li>3. 水管管路探測器為流動地在水管中蒐集讀數而非傳統使用單一固定點的測量，因此可在各位置採集最直接、正確的資料。</li> </ol>

<p>市場潛力</p>	<p>一般三十坪左右的老舊房舍若為了得知水管配置圖而拆除牆壁、管線探勘、重新砌牆、粉刷油漆，總共需耗費的金錢約為 20 萬台幣。而台灣自來水平均每年因漏水而流失兩座翡翠水庫的蓄水量，亦即一年約流失 7 億 1382 萬，若可因水管管路探測器而減少需拆牆的情況、減少漏水的量，以上所耗費的金錢勢必可以大量減少。</p> <p>在近幾年綠色環保議題抬頭，讓我們不得不換個立場思考：也許金錢是有形且可計算的，但耗損的水資源、能源、以及對地球造成的破壞卻是無形、無可計量但卻是永恆的。</p>
<p>產品/技術 智財權保護方式</p>	<p>(由產學合作中心填寫)</p>
<p>圖片 (已公開之成果可提供圖片)</p>	 <p>The image contains two photographs of a spherical, transparent device. The top photograph shows the device from a slightly elevated angle, revealing internal wiring and a circular component. The bottom photograph shows the device from a more direct side view, highlighting a prominent circular lens or sensor on its surface. The device appears to be a pipe leak detector as mentioned in the text.</p>

## Marketing Abstract of NTU's Invention Disclosure

NTU's docket no: \_\_\_\_\_ (由產學合作中心填寫)

CIAC contact :                      Tel :                      e-mail :

<b>Title</b>	PipeProbe
<b>Inventor (s)</b>	Hao-hua Chu, Polly Huang, Tsung-te (Ted) Lai, Yu-han (Tiffany) Chen
<b>Brief Description</b>	The first step in fixing leaking pipes is to locate where they are for further inspection. When leaking water pipes are hidden inside walls and underneath floors, diagnosing their location without direct inspection becomes very difficult, especially when the original diagram of the pipeline layout is also missing. Searching for the pipeline locations becomes guesswork and often requires a brute-force method, such as knocking down walls and stripping floor coverings. This problem created an opportunity for the development of PipeProbe, a mobile sensor system for determining the spatial topology of hidden water pipelines behind walls. PipeProbe works by dropping a tiny wireless sensor capsule into the source of the water pipelines. As the PipeProbe capsule traverses the pipelines, it gathers and transmits pressure and angular velocity readings. Through temporal-spatial analysis on the sensor readings, our algorithm locates all turning points in the pipelines and maps their 3D spatial topology.
<b>Fields of Application</b>	Any structure which needs to reconstruct the pipelines 3D spatial topology
<b>Advantages</b>	<ul style="list-style-type: none"> <li>• To reconstruct the pipelines 3D spatial topology, instead of knocking down walls and stripping floor coverings, a novel localization method was developed to accurately estimate the 3D spatial topology of the capsule-traversed water pipelines from the pressure and rotation graphs collected and computed by the PipeProbe system.</li> <li>• Rather than fixing sensing points in the utility infrastructure, PipeProbe adopts a mobile sensing approach in which a mobile sensor travels and performs on-the-spot data collection at different places.</li> <li>• Since the PipeProbe capsule is designed to model a water droplet, its physical movement leverages the force inside of the pipeline infrastructure for propulsion. This means that no motoring is necessary to power its movement, which increases the PipeProbe capsule's energy-efficiency and allows it to operate on only 15 mA of current. To illustrate, a tiny lithium button cell battery can keep our PipeProbe capsule operating for over 1 kilometer at a water flow rate of 15 centimeters per second.</li> </ul>
<b>Market Potential</b>	Due to water leakage, the amount of water Taiwan lost each year is about the amount in two water reservoirs which is more than 700 million.
<b>IP Right(s)</b>	

Picture

