



## 投文字 T：輔助投影教學系統 Auxiliary Teaching System

隊伍名稱 藤園豆腐店  
TN Tofu Shop

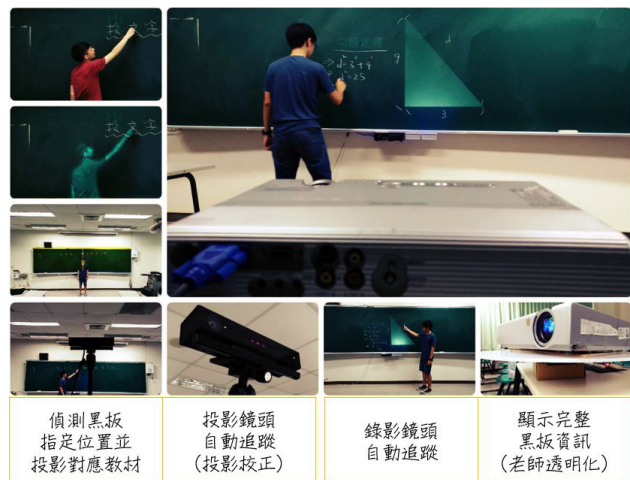
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### 作品摘要

在資訊化的社會中，教學的形式並不只侷限於教室內，除了老師親自與學生面對面授課之外，我們也能夠透過網路來分享與傳播知識，使得世界各地的人都能夠透過電腦或智慧型手機來學習新知識，而其中教學直播也是常見的一種授課方式。然而網路教學的方式雖然大大的縮短了老師與學生的距離，但是在收看直播時往往會受到一些情景的限制，現在的直播教學模式主要針對老師與學生一對一遠距教學或以人數較少的小班制的方式授課，授課方式較接近於老師與學生直接透過視訊互動，然而另一種常見的教學直播方式是在教室內透過黑板進行授課，同時會有在教室中聽課的學生以及收看教學直播的學生，在這樣的教學情境中，老師需要顧慮的情況會比較多，然而市面上卻無法有完善的系統能夠協助老師處理這些問題，進而影響到直播教學的學習體驗，因此我們針對這樣的教學模式，以及可能會發生於遠距學習學生身上的問題進行改善，以下是我們條列出遠距學習學生的問題：

#### 【遠距學習學生】

- 黑板被老師擋住而無法順利觀看、抄寫筆記。
- 會因老師與鏡頭的移動速度不同步而影響觀看。



的問題，多媒體教學時代來臨，許多教學業者會選擇引進電子白板等技術設備來改變教學模式，電子白板能夠透過電腦控制，使得教材的使用更為容易，除了能夠輕易透過觸控來繪製線條，儲存曾寫過的字也十分容易，電子白板的出現使得教學的自由度大大提升，但是礙於成本問題，電子白板的售價往往使人望之怯步，而相較之下黑板教學的建置成本低，現有教室多搭配投影機來提升教學的便利性，因此我們也針對老師教學時會面臨的問題來進行改善：

#### 【老師】

- 常見教學方式有投影片教學或板書教學，但兩者無法同時使用。
- 電子白板教學因直接對螢幕書寫，會有誤觸、觸碰不良、寫字不順的問題，且使用範圍小成本又太高。

基於上述問題，我們作品將針對老師與學生的困擾，分別提出兩個系統功能來解決，針對觀看直播的學生所提到的困擾，「無死角教學直播系統」將使用影像處理技術，搭配深度攝影機 (Kinect 2)，來解決直播教學時影像可能會產生的問題。對於老師上課所面臨到的問題，我們也將使用影像處理技術搭配一般教室中隨處可見的投影機結合伺服馬達控制，建構出一個既具互動性又富有使用者操控性的「全黑板互動投影系統」。

結合了「無死角教學直播」以及「全黑板互動投影」兩大區塊功能，就是我們此次作品的全貌「投文字 T：輔助投影教學系統」。

◀ 圖 1. 投文字 T: 投影輔助教學系統是以提供更方便的教學為目標，整合了主要四項功能的輔助系統，在未來的網路線上學習，將會是教學的得力助手

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### Abstract

In an information society, teaching is not confined to the classroom. In addition to teaching face to face, we can also share and spread the knowledge on the Internet so that people from around the world can learn new knowledge from computers or smartphones. Online teaching is a common teaching style. However, online teaching shortens the distance between teachers and students, but some scenarios may be restricted while watching online teaching videos. Nowadays, online teaching is mainly for one-to-one or small size classes. One way is interacting directly between the teacher and the student through the video. The other way is teaching with a blackboard in the classroom through the video. But in above-mentioned situation, the teacher needs to concern about more scenarios. However, there are no perfect systems that can help teachers solve these problems and it may have an impact on the learning experience of online teaching. Therefore, we list the following problems that may happen to distance learning students:

#### 【Distance learning students】

- Cannot copy notes and watch the video well when the teacher blocked the blackboard.
- Have an impact on watching the video because the movement speed of teacher and the camera are not consistent.

Now we are going to discuss what happened to teachers. The multimedia era is coming, the teaching industry will introduce electronic whiteboards and other equipment to change the form of teaching. The electronic whiteboard is controlled by a computer so that it is much easier to use teaching materials. In addition to touching on the screen to draw something easily, the electronic whiteboard is easy to save words that were written. The electronic whiteboard makes teaching more flexible than before. However, the price of the electronic whiteboard is too high to deploy. By comparison, teaching with a blackboard is low-cost and can be combined with a projector to improve the convenience of teaching in many classrooms. We also list the following problems that may happen to teachers:

#### 【Teachers】

- Slides and blackboards cannot be used at the same time while teaching.
- There might be some writing problems with the electronic whiteboard. The usable range of the electronic whiteboard is insufficient and the electronic whiteboard is high-cost.

Based on the above problems, our product will propose two systems to solve problems for teachers and students respectively. For distance learning students, "No-Blind-Spot Live Teaching System" is based on image processing with Kinect 2 to solve problems when watching online teaching videos. For teachers, "Full Blackboard Interactive Projecting System" is based on image processing and projector rotating control with a motor. It is interactive and user-friendly.

Our product "Auxiliary Teaching System" consists of "No-Blind-Spot Live Teaching System" and "Full Blackboard Interactive Projecting System" to provide the better experience of learning and teaching for students and teachers.

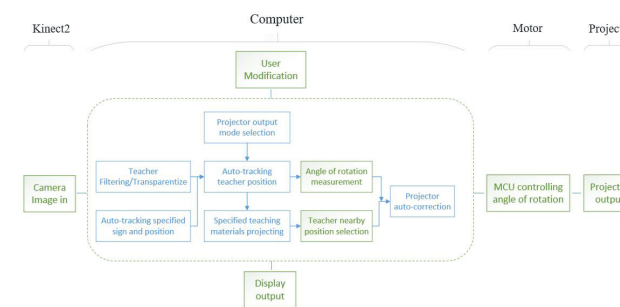


Fig 2. Functional architecture diagram