DIGITRONIC DISPLAY INTERFACE

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Abstract—Anything written on a non- interactive screen using a special pen built in this project is seen on the laptop screen via the projector. Thus converting any non-interactive ordinary surface into a touch screen device. DDI works on the principle of the Infrared technology which is the current technology prevailing. An Infrared sensor, Infrared LED and a projector are the basic must needed components for the DDI. The Infrared Communication between the sensor and infrared LED is the basic principle of the working. This project makes use of components available in our surrounding and is therefore low on cost technology and yet an efficient one. Use of TV remote, Wii remote as sensors ensured efficient output.

Index Terms—DDI, Infrared (IR) Pen, IR sensor, Smart board, WII remote.

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1 INTRODUCTION

IN this world of digitization everything is becoming Smart these days. Right from Smart Phones to smart TVs technology is drastically evolving day by day. So here we attempt to make our very own smartboard with minimum cost and resources. Thus our Digitronic Display Interface DDI will not only be an efficient alternative to overpriced smartboard but it will also turn any non-touchable display device into an interactive touchscreen interface.

This Low cost white board was previously developed by Johnny Chung lee [1].

1.1 Need

Although Interactive smartboards ISB has appeared since late 2000s However it is mainly used in special classrooms in India because of the high cost. ISB allows teachers and learners to interact directly on the screen to increase the visual effect for teaching and learning process [2]. It becomes very easy for students to understand what teacher is trying to convey. Visualization of concepts becomes far too easy for students to grasp with digitized interactive learning board.

This research aims to develop and use ISBs in classrooms in India at an affordable cost.

1.2 Problem Statement

The objectives of the research are:

- To explore the ways to develop ISBs at an affordable cost,

- To explore, trial and apply programs which can support teaching with low-cost ISBs

- To convert any turn any non-touchable display device into an interactive touchscreen interface

- To verify applicability of low-cost ISBs with Wiimote in the context of teaching and learning in India.

- To completely eradicate paper-pen, chalk-board and marker-pad system of teaching!

1.3 Social and Environmental impacts

DDI would revolutionize the world of technology if advanced changes would be made in its hardware and software. It would make lives easier and would therefore be a great boon to the society. If camera is added to the setup, it would be a whole innovative smartboard within

5000 Rupees using IR technology. No use of fuel consuming machinery makes it environmental friendly.

1.4 Cost Management and Sustainability

The aim being to make DDI cost effective and hence as minimum resources are used, we get a product that is of minimum cost. Cost is greatly reduced as it requires only IR sensor and IR pen. No huge cost consuming components are used thus making it cost efficient.

The changes to make development are easier and cost effective. Hence it is sustainable to the outside world. The best part about DDI is that it's a developmental project and it can be synced and used with already existing pc monitors and projectors [5].

2 REVIEW OF LITERATURE
2.1 Smart board

The Smart Board interactive whiteboard operates as part of a

system that includes the interactive whiteboard, a computer, a projector and white boarding software - either Smart Notebook collaborative learning software for education, or Smart Meeting Pro software for business [1]. The components are connected wirelessly or via USB or serial cables. A projector connected to the computer displays the desktop image on the interactive whiteboard [4]. The whiteboard accepts touch input from a finger, pen or other solid object. Older models rely on an external projector to work but certain projector-based models have an integrated projector built in to the top of the Board. The newest models can display UHD graphics and are self-contained flat panels which do not need a projector. Some of these self-contained flat panel models are also equipped with a motion sensor on the bottom-right corner of the board. This sensor can save power by putting the Smart Board to sleep when no movement is detected.

2.2 Interactive Display Interface

It is a large interactive display that connects to a computer and projector. A projector projects the computer's desktop onto the board's surface, where users control the computer using a pen or other device. The board is typically mounted to a wall or on a floor stand…etc.

Typically, DDIs are used in lecture or classroom environments and the technology allows users to:

• Manipulate text and images

• Take notes in digital ink

• Save notes for review via e-mail, the Web or print

• View websites as a group

• Uses software at the front of a room without being locked behind a computer

• Create electronic lesson activities with templates and images

• Show and write notes over educational video clips

• Use presentation tools built into DDI's software to enhance learning materials

• Showcase student presentations

3 PROPOSED METHODOLOGY

Table 1. Components Used

No.	Devices	Picture	Main function
1	Wii remote (Wiimote)		Track sources of infrared (IR) light (required)
2	Infrared pen (Built)		Work as a pen to interact on the screen (required)
3	Bluetooth Adapter		Connect Wiimote with Computer (Required with computer with no bluetooth)
4	Tripod stand		Hold Wiimote in class

Table. 2. Softwares Used

| No	Name	Main function
1	Net Framework 3.5	Run Wiimote Whiteboard which is based on .NET Framework (required)
2	BlueSoleil 6	Support easily to connect Wiimote with computer (optional)
3	Wiimote Whiteboard v.03 or Smoothboard 1.5	Simulate ISB (Required)
4	Linktivity Presenter	Annotation software (optional)
5	SmartNotebook 10	Annotation software (optional, suggested)

4 WORKING AND IMPLEMENTATION
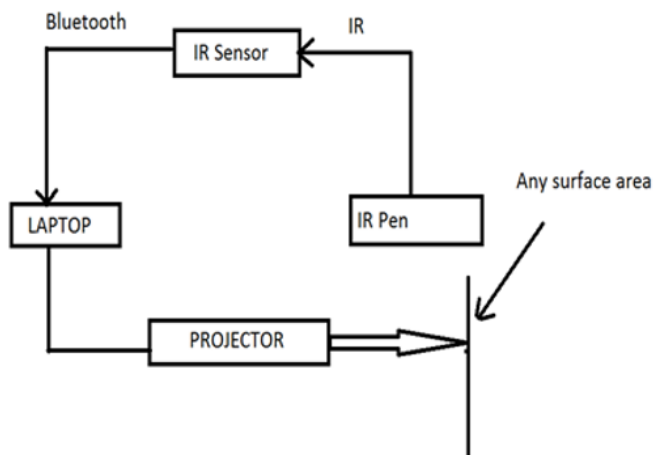
Fig. 1. DDI Basic Block Diagram

4.1 Building IR Pen

The LEDs used are Vishay TSAL6400s running at 100mA, but lots of other LEDs will work too. These LEDs might also be able to jump start your experimentation by retro-fitting a mini keychain light with an IR LED [1]. All necessary things are a marker, an infrared led, a push-switch button, electric wire and an AA battery. These are a normal IR-Pen and a long IR-Pen.

4.2 Interfacing IR sensor and laptop

- Install Net Framework 3.5
- b. Turn on Bluetooth device on your computer or if there's no integrated Bluetooth in your computer, connect Bluetooth Adapter into it then install associate driver.
- Install Bluesoileil 6 to easily connect with any Bluetooth devices.
- Press the 1 and 2 buttons on the Wiimote at the same time so all four lights blink. While the lights are blinking on the Wiimote click on the orange sphere in the BlueSoleil program to find the Wiimote. Once the orange sphere is clicked, it will find a device similar to the above picture.
- Press both at same time.
- Put Wiimote camera at a 45-degree angle with the screen. As a basic guide the Wiimote needs to be placed about double the distance of the height of the projected surface away from the surface.

- Start Wiimote Whiteboard or Smoothboard software, press button A on Wiimote to calibrate before using.
- After the above steps, the teacher can use infrared pen to interact directly on the screen (projected surface). Each time the teacher turns on the led by press button on the pen as he or she clicks the mouse on the computer screen. There are a lot of applications that can increase the interactive potential of ISB with Wiimote.

4.3 Wiimote Alignment

When written by the IR pen on the screen, the movement of the IR pen is detected by the IR sensor. The sensor is connected to the computer via bluetooth. The movement of the pen will be sensed and changes will be made on the computer screen, thus making changes on the projector screen. Thus all the hand written content on the board gets converted to digital format.[2]

The Wii remote must be Mounted with your projector and Wiimote on the ceiling head

From the piloting class, the researcher recognized that ceiling is the best place to mount your Wiimote. In the classroom, the teacher and students are not distracted by the Wiimote.

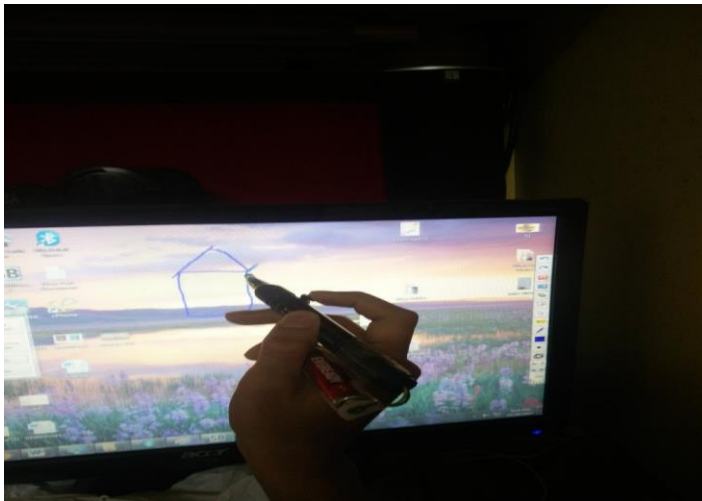## 5 EXPERIMENTAL SETUP

Fig. 2. IR Pen

Fig.3.Illustrating figures using smoothboard app

6 Advantages

6.1 General Benefits

- Basic DDI setup is Very Cheap. You can buy the IR setup within 5000Rs as compared to 50000Rs smart board setup.
- Ours is a developmental project so it can be easily interfaced with the existing computers and printers.
- Visualization of 3 dimension concepts becomes very easy for students to understand.
- You can practically use it anywhere and everywhere.
- Versatility, with applications for all ages across the curriculum.
- Increased teaching time, because teachers are able to present web-based & other resources more efficiently.
- More opportunities for interaction and discussion in the classroom.
- Increased enjoyment of lessons for both students and teachers through more varied and innovative way

6.2 Benefits For students and teachers

- Greater opportunities to integrate DDI in lessons while teaching from the front of the Class.
- Increased spontaneity and flexibility, since teachers can draw on and annotate a wide Range of web-based resources.
- Teachers can save and print what is on the board, including any notes made during the Lesson, reducing duplication of effort and facilitating revision
- Teachers are able to share and re-use materials, reducing workloads
- Widely reported to be easy to use, particularly compared with using a computer in whole class teaching.
- Inspiration to teachers to change their pedagogy and use more DDI, encouraging development.
- Increased enjoyment and motivation, giving greater opportunities for participation and Collaboration, developing students' personal and social skills
- Reduced need for note taking because users can save and print what appears on the board.

- Different learning styles can be accommodated as teachers can call on a variety of Resources to suit particular needs
- Students can be more creative in presentations to their classmates, increasing self-confidence.

7 Challenges

- Like any other technology DDI has disadvantages. The cost of the DDI setup is less however, the software license, projector, and installation fees are slightly high.
- Another disadvantage of DDI can be its accuracy. If the positioning of Wii remote sensor is not done correctly then the output is not obtained
- Batteries in the Wii sensor and IR pen need to be changed from time to time
- Since IR pen is an input device you can think of using it as a mouse. However double click option is not possible using this setup
- DDI can also be a problem if they are not working correctly on a given day. A teacher would always need to have a back-up lesson plan or activity in case the technology crashes. Additional time would need to be put into planning each day for the teacher.

8 Conclusion

From the results of the survey, the researcher found that with some Wii remote modifications, low cost DDIs can be used widely in the context of India and other developing countries because of affordable cost; and most of necessary functions of a Smart Board can be activated and employed.

Thus the Current Chalk board system of learning in India can be completely eradicated. It will greatly help the students in understanding the complex concepts [6].

With digitization in so much demand, if successfully implemented in a large scale, DDI will completely change the way of classroom study learning in India. With laptops and mobile phones present, all the notes will be readily available to students and they need not make separate copies.

With enhancement in this IR based DDI many costlier concepts can be made cheaper thereby increasing military and medical applications.

So, DDI is all set to revolutionize our way of living with minimum cost!

9 References

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