# Digital Signal for Indian Railway

**\*1Fajar Ayaz Ansari, 2Nitesh Sharma and 3Dr. Vinodini Katiyar**

\*1, 2, 3Department of Information Technology, Dr. Shakuntala Misra National Rehabilitation University (DSMNRU), Lucknow, Uttar Pradesh, India.

**Abstract**

In India we all know that railway play a big role in transportation we also take trains for traveling from one place to another and also train play a big role for transfer of goods from one state to anther we all of this prefer the train for traveling or for transferring of good because of the cost of the trains is cheaper than the other transportation van like truck, personal cars etc. But we all know that the main problem in India is train delay every day we see that the train are very delay and sometime many trains are cancelled due to over delay this delay happen because the train track are busy because of the miscommunication between the train driver and the station master and sone this also accident are happen due to the miss communication between them this is the measure problem in India's railway.in India right now the information about the track is given to the trainmaster outside of the station is by the nearest station master so this communication gap make delayed of trains and sometimes the accident also occur for overcome of this type of problem we have an idea to implement the digital signal for railway in which we divide the track into section which are also called the block and at each section or block we setup the four different type of indication light which is directly connected to the speed of the train these color are red, green, yellow and double yellow these color indicate the different-different speed which we will see below and we use microprocessor which catch the signal from the trains and help in the communication by which the trains are not stop far from each other it stand closest to each other and the time delay is reduced.

**Keywords:** Digital signal, digital signal processing, Atmel microprocessor

## 1. Introduction

Digital signal technology [1], as an important product of this information age exist in all aspect of the communication field and in an indispensable technology in the communication field, which effectively promote information exchange and information sharing. This research paper analyzes the factor importance for maintaining the time regulation of the Indian/our railway. As we know from the last decades the signal of Indian railway for trains is given by the driver of the train and the nearest station master, and some time that signal are not being connected due to the poor weather or some miss communication between the driver and the station master due to which sometime the accident occur and the maximum time the trains are late from their original time and sometime many train are canceled due to the busyness of the roots of that trains due to which people face many problem. The digital signal technology helps us to overcome from this type of problem. The problem in traditional signal is that when there is a long gap between the two stations then the train which start from first station pass the first station second train cannot be starts until the first train reach to the second station and between this long gap there is no any signal is present for the next train due to which train become late. By the help of making of digital signal we are able to solve this type of problem. The problem occurs due the old signal problem like delayed of trains cancelling of trains accident of trains maybe will be solved by this digital signal.

## 2. Digital Signal

A digital signal is a signal which represent the data in order of different value. A digital signal not contain many values it only contains the value of binary numbers which are 0 and 1, where 0 represent the OFF and 1 represent the ON [2]. It is a light signal or visual display device signal that give instruction or supply digital warning to the driver of the train or station master.
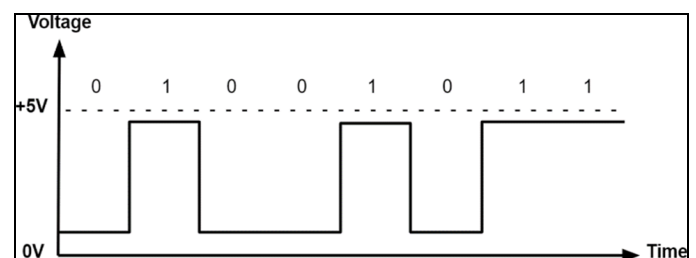


**Fig 1:** Digital Signal

**Digital Signal Processor (DSP)**

Digital signal processor (DSP) [3] is a real-world signaling processor which take signal like voice, audio, video,

temperature and pressure or that something has been digitalized and then mathematically manipulated them. In this project we use this digital signal in the front and at the end of the train and also on each signals poles by which when the train is crossed or stand there this digital processor give the signal to the next train driver by which he know about the routes and drive according to that signals light.
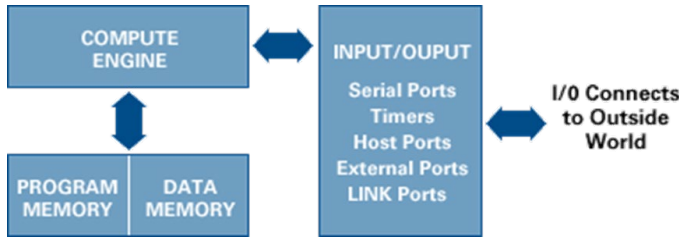


**Fig 2:** Digital Signal Processor (DSP) Block diagram.

## What's Inside a DSP?
A DSP contains these key components:
- **Program Memory:** Stores the programs the DSP will use to process data
- **Data Memory:** Stores the information to be processed
- **Compute Engine:** Performs the math processing, accessing the program from the Program Memory and the data from the Data Memory
- **Input/Output:** Serves a range of functions to connect to the outside world

## 2.1. Atmel Microprocessor [4]
It is an automatic processor used in a various automotive application like powertrain, safety, entertainment etc. it is design or programmed is very best it can easily catch the signal like audio, video, light etc. and sifting the proper signal to the user so that he can take the proper decision on the basis of that signal. It is a wireless device which we will used in the trains and it help to navigate the trains driver. The main work of this device is to send the signal to the user by which he can manage the speed of the train.



**Fig 3:** Atmel XMEGA-B1 Block Diagram

## 3. Proposed Methodology
The methodology which is used in the digital signal are follow.

## 3.1. Space Interval Method [5]
It is based on the distance between the two trains or the gap between the train in this method the stop point of the trains are divided into blocks and from the specific distance another section called "block" is made and for every block at starting and ending points digital signal are made which help the train driver in navigation and according to that signals driver can

manage the nearest distance from the other train which is stand in the front of that train by which there is a specific space is empty in which another train is stand and the distance between them is less and this also help is managing the time of the train. This is the method in which when the train are start from same station in the same direction from a successive interval of time. The spacing between the trains are managed such a way that if the first train is stop then the other trains are also stopping to the nearest to the first train.
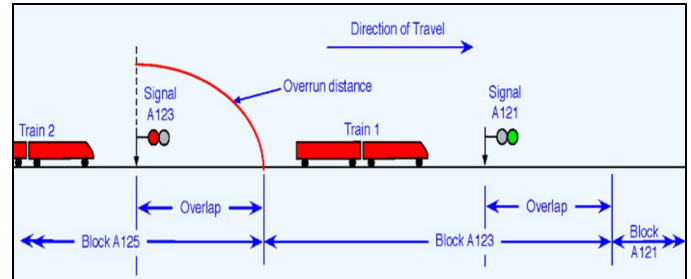


**Fig 4:** Space interval methodology

*This diagram shows that the closest space between the trains after dividing the track into section.*

## 4. Working Principal
The working principal of the digital signals is also based on the three traditional light of the signal, between the every section or block there are two signals are established one is at the starting of the section and one is at the end of the section and these signals established between the every section of the rail track these signals contains a sensor, and also every trains have two sensor one is at the front of the trains and another is at the end of the trains which help the driver into the communication. When two trains starting from the same station with successive time interval then these digital signal help to communicate them when first train cross the first block the train's back sensor give the signal to the last train by which the next signal become green for the last train. These signals also based on the speed of the train which means when the signal is green then the train can move with the speed above the 100 kilometer per hour, when and after the green signal the next signal on the next block is double yellow which indicate that the speed of the train is 60 kilometer per hour, and after that on the next block the signal is only yellow which indicate that the speed of the train is not more the 30 kilometer per second and at the nearest to the first train means at the last signal the color of that signal is red which means the train should be stand at that section or block or the speed of the train is 0. And these signal processes are going for the next trains.
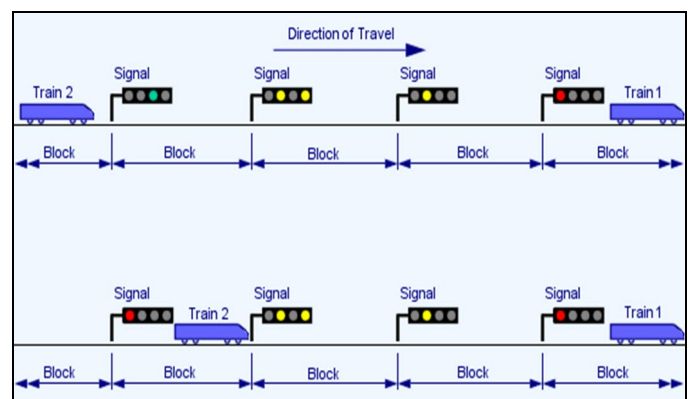


**Fig 5:** Signal changing according to trains passes

< 31 >

## Indication of the Signal

The green light indicates that the train can proceed [8].

Double yellow indicates that flashing single or double yellow aspect indicates that a train is to take a diverging route ahead with a lower line speed than the main route which is less than 60 km/h [10].

Single yellow indicate that the train can proceed or take a diverging rout ahead with a lowest line speed that the main root which is less than 30km/h [9].

As everyone known that the red light is the signal to stop, when the train reaches to the red light it stands [11].

## Algorithm

**Step 1:** When 1st train start 1st signal become green.

**Step 2:** When train 1stcross the first signal it changes its color green to red.

**Step 4:** When the1st train cross the first section first signal become single yellow.

**Step 4:** When the first signal crosses the second section the first signal become double yellow and the second signal become red.

**Step 5:** When the train cross the third section then the 2nd light become double yellow and1sr light become green and the 3rd light become red.

**Step 6:** When train reach to the next station the signal start from start as first train and this process is going on
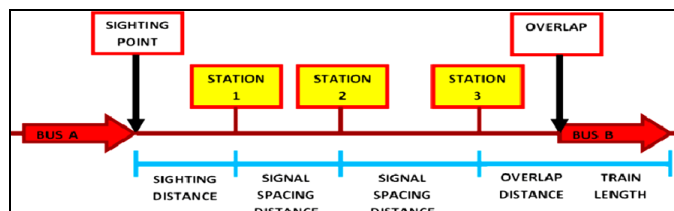


**Fig 6:** Station Division with signals.

In the above figure we see that when the digital signal is implemented then each section which are divided as block is become the substation for the trains where each train are stand without any delay.

## 5. Characteristics of Digital Signal

When installing of digital signal one main problem is occur is that the all the old equipment must be replaced simultaneously. But implementation of digital signal has also many pros.

- It is easy to implement everywhere.
- It's not too much costly.
- With the help of this signal we can stand the train closest to each other by which the time delayed of trains is reduced.
- In this there is no need of extra man power only minimum no of people can take care of this.
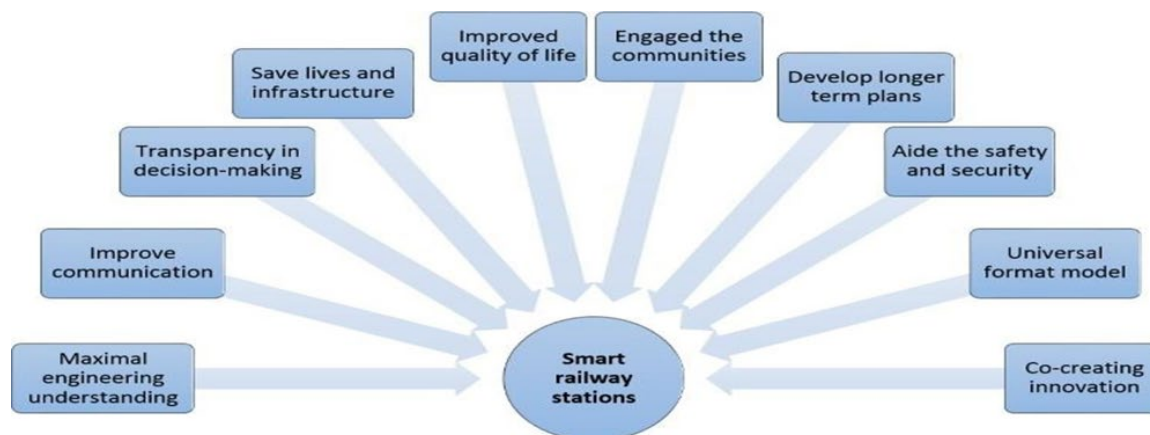- By the implementation of this many train accident are controlled.



**Fig 7:** Smart Railway Station

## 6. Conclusion

This digital signal enlarge strategy manufacture dependable results. Follow of the system using ATMEL detector and digital signal refining Technology may enable the rail department to safeguard the human life from accidents. And also managing the time delayed of the train which are delayed due to the miss communication between the train's driver and the station master by the implementation of this technology there is no need of communication between the train driver and the station master on the clearance of the rout of the train the driver easy understand the routes of the train by showing the signal which are established at the each section or each block on the track.

## References

1. https://www.researchgate.net/figure/Generation-of-digital-analog-signal_fig1_
2. https://en.wikipedia.org/wiki/Digital_signal_processor#Software_architecture
3. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://ww1.microchip.com/downl oads/en/DeviceDoc/Atmel-1768-32-bit-ARM920T-Embedded-Microprocessor-AT91RM9200_Datasheet.pdf
4. https://www.microchip.com/en-us/development-tool/atxmegab1-xpld

< 32 >