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Monitoring blasting operations using multiple GPS tracking points

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ABSTRACT

The First stage of the mining operations is drilling and blasting. Majorly accidents in blasting operation causes due to the blast are security, fly rock, misfires and premature blast .the major of the percentage of causes blast area security and fly rock has registered high percentage of accidents, we arrange the GPS tracking to the workers to monitoring the blasting operations to reduce the accidents in blasting operations with real time monitoring

KEYWORDS: *Blasting, GPS tracking, Tracking application.*

I. INTRODUCTION

Mining is the operation of extracting ore minerals from the earth crust also mining is the one of the major industry for the economy & development of the country. The five stages in the mining operations they are Drilling, Blasting, Loading, Transportation, Crushing. The first phase of the mining operation is drilling and blasting.

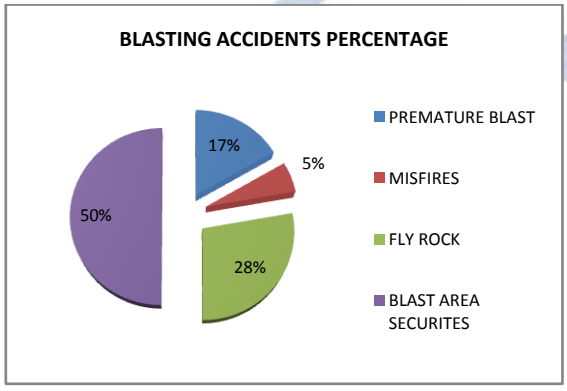

Fig.1: Blasting accident data in mines

Blasting is the process of breaking rock into small pieces using high explosive. Blasting operation the main causes for accidents is blast are security, fly rock, misfires and premature blast.as per accident data the major accident causes is blast area security and fly rock.fig.1 represents the data of percentages of blasting accidents in mines.

1.2 BACKGROUND WORK:

Researchers and scientists have studied the major causes and accidents due to the blasting accidents in mines [1] Bajpayee et al., (2004) analysed the blasting injuries in surface mining and observed that Fly rock and lack of blast area security accounted for 68.2% of these injuries &In (2004)analysed the fatal injuries due to lack of the blast area security due to several factors done for improper blast security& In (2002) analysed fly rock and blast area security fatalities from 1989 to 1999

and examines the causative factors like lack of blast area security& in adequate blasting shelter, fail to follow instructions and unsafe location.[2] Larry.R et al.,(2000)analysed the three major causes for the blasting accidents and considering several human factors to improve blasting safety.[3] Seccatore et al., studies about the methods of handling blasting risk by Risk rejection ,Risk factor, risk reduction to prevent the blasting risk.

1.3. FLYROCK:

Fly rock means the small rock pieces travel with high speed in air landed at long distance. Fly rock is developed due to in blasting using high explosive charge or improper stemming and loose material present at the top of the blasting face.

Fig: 2 Image related to fly rock accident

Fig: -3 Images related to fly rock generation

The below table -1 shows the previous fly rock accident data.

Table-1 Case studies related to the fly rock accidents [4]:

S.NO	DATE	CASE STUDIES
1	JULY/16/2007	As per case study at the mine worker should injured for the fly rock from the blasting operation stayed in nearly 1500 feet from the blasting operation
2	SEPTEMBER/7/2011	As per case study the underground worker stayed at the ramp for the signal of blasting initiation due to vibration debris fall on the person accident are happened he was died.
3	DECEMBER/4/2013	As per case study the underground workers are working at the face due to the blasting in the other panel the roof fall happened due to vibration the injuries happened
4	JANUARY/12/2016	As per case study the truck present at the public road the fly rock was left from the mine site the driver and passengers has minor injuries happened.

1.4 STAGES OF BLASTING

The five stages in blasting are charging, stemming, guarding, and exploding. Charging is the process of filling explosive into the drill holes and stemming is the process of pouring mud or sand into the drill hole with certain pressure, Guarding is the process of clearing danger zone before blasting, exploding is the process of giving ignition to the detonator.

1.5 OBJECTIVE:

To create the GPS monitoring app to track multiple tracking points at the blasting site.

II. METHEDOLOGY

To create the blasting GPS application to track the positions of the blasting workers while blasting operations to avoid the accidents in mines by the blasting operations .to track the real times monitoring of blasting workers.

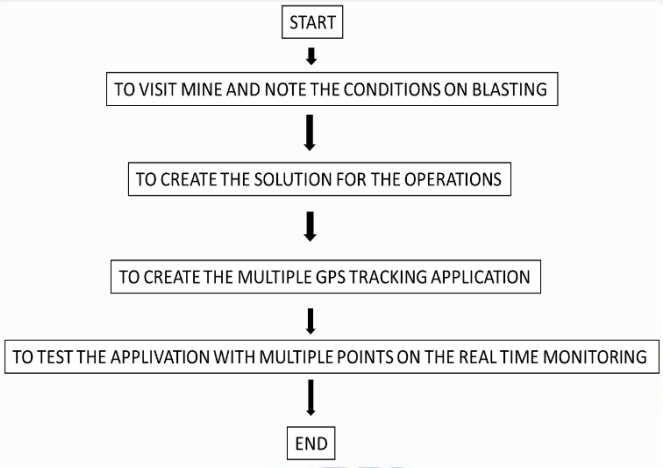

Fig.4-Flow represents the proposed work

2.1 DATA COLLECTION:

As per accident data from the 1978-2010 shown in the table-2

Table-2- Mine blast injuries during 1978-2010[5]

	SURFACE		UNDERGROUND			
	NON -METAL	COAL	NON-METAL	COAL	TOTAL	PERCENTAGE
Transporting explosives	0	0	11	0	11	0.0096
Premature blast	33	37	50	14	134	0.1165
Blast area security	93	92	70	315	570	0.4956
Fly rock	71	55	0	0	126	0.106
fumes	0	0	80	21	101	0.0878
misfires	26	11	50	54	141	0.0965
Disposing	3	0	2	0	5	0.0044
miscellaneous	25	91	7	28	151	0.0687
surface accident at under ground mine	0	0	4	9	13	0.0113
TOAL	251	286	274	441	1252	1
PERCENTAGE	0.2217	0.1739	0.247	0.3574	1	
MINE BLAST INURIES (FATAL-NON -FATAL) DURING 1978-2010						

To visit road metal quarry in near Kakinada district, yellaswaram at sussuram village to observe the mining operations and causes for the blasting operations.to get the mine permission from the mining engineer p.vijay Kumar swamy.to collect the data of mine and coordinates of the mine.

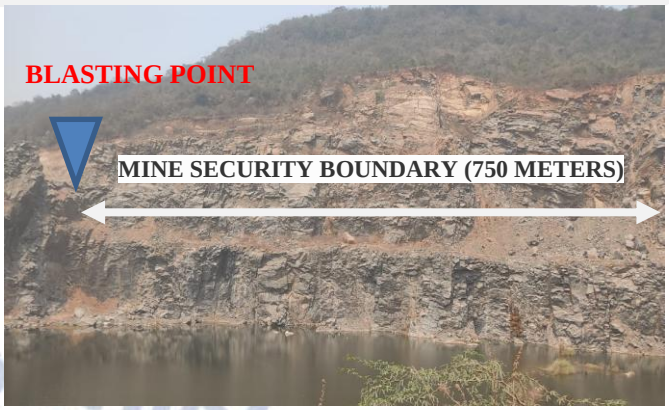

Fig.5-Mine blasting point to mine security boundary

2.2 GPS TRACKING APPLICATION:

The home page contains longitude and latitude to see the mine location and change the view mode in traffic and satellite mode.

Longitude and latitude: The every mine plan the co-ordinates was mentioned basing on the co-ordinates to enter into the longitude and latitude portion then shows the maps in the location of the co-ordinates

Satellite & normal mode: The map view shows in the satellite image mode and normal traffic mode basing on the requirement change the mode

To track the GPS trackers coordinates on the application. Turn on the GPS tracker movement of the GPS tracker shown in the application for real time monitoring

2.3 HOME PAGE OF TRACKING APPLICATION:

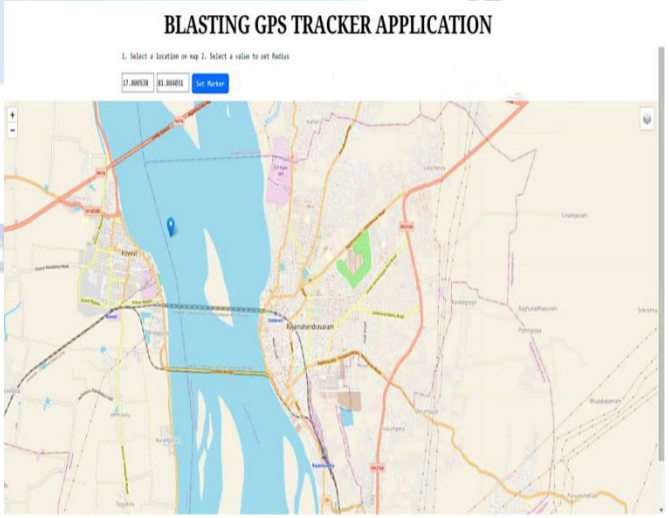

Fig.6 - Home page for blasting GPS tracker application.

2.4 GPS TRACKER:

Global positioning system is used to tracking or monitoring any particular object or person.Trackers are working on various types similarly SIM based and satellite based Trackers. The trackers are associated with satellite the co-ordinates collect from the satellite send to the application through receivers send the information. GPS has three parts satellite, ground stations and receivers for working GPS.While monitoring the tracking position

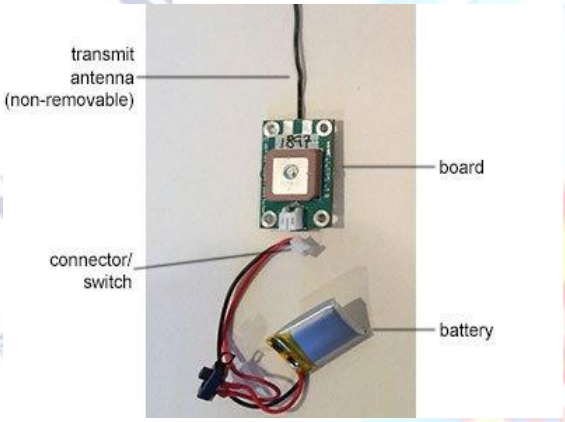

Fig 7- Parts of GPS tracker

III. RESULTS & DISCUSSION

Our objective to perform the application in the mines to check the real time monitoring to visit the road metal quarry near the yerravaram.to check the GPS tracker application with GPS trackers

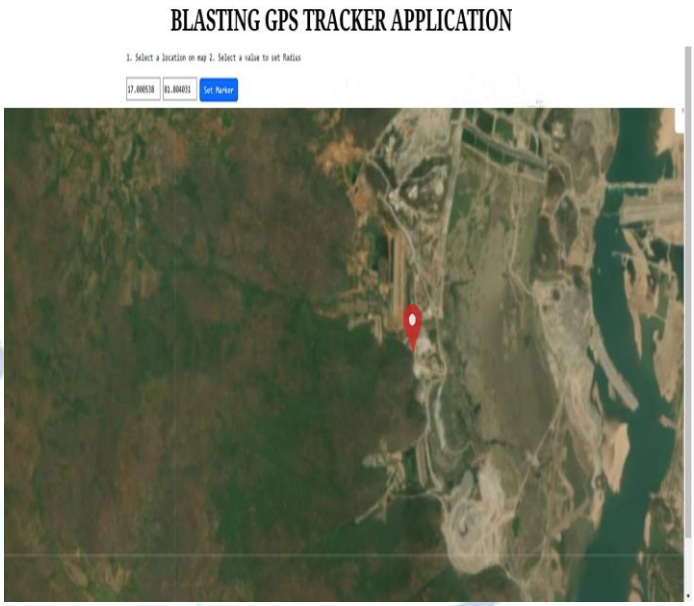

Fig 8- location showing in the application

The above Fig-8 represents the location of blasting worker monitoring in tracking application

Fig 9 - Blasting location showing in the application

After checking the results in the application and coordinates the accuracy of the location is good and easy to monitor the blasting workers while conducting blasting operations.

IV. CONCLUSION

The finds present reason for the major accidents due to the blasting operations in the main causes are blast area security , Fly rock, Premature blast and misfires .The

blast area security and fly rocks are the high percentage of accidents happens in the blasting operations. Communicate with the blasting officer while guarding operation. The significance of this study will help engineers to understand the eliminate the accidents due to blasting in mining operations , it will help to avoiding the main causes like communication and real time monitoring operations in the blasting operations.

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