An Anti-Theft Oil Pipeline Vandalism Detection: Embedded System Development

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Abstract- This act of pipeline sabotage, stealing remain a great security challenges for both government and people of the affected countries, as this ugly activity usually resulted in a significant loss. Such as economic downfall, loss of human lives, environmental pollution and destruction of aquatic animals. An anti-theft oil pipeline vandalization system based internet of things technology was developed using ATmega328, GSM and GPS to render a remote information monitoring. The prototype was implemented and tested in a lengthy pipeline of 10m with configuration threshold range from 28 to 210. The result obtained contain sensor nodes position in a pipeline network, geographic locations (longitude and latitude) and distance, which are transmitted as SMS alert to the base station (BS). It is expected, that this technology will assists early detection of vandalism of crude oil pipelines and guide the security agent on the exact location of any ongoing theft activities.

Keywords- Anti-theft; Crude oil; Geographic location; Pipeline network; Prototype.

1. Introduction

Nigeria is among the largest oil producer in the world and first in Africa. Crude oil mining is regarded as the main sources of income in Nigeria while agriculture, manufacturing industries and other income generation sectors are supportive. Crude oil is largely use by automobile company across the world for industrialised a wide variety of essential materials such as plastic production (baby toys, car parts, computer cases and so on), electronic system (mobile phone materials, camera cases, speakers, etc), clothing materials, furniture, and kitchen items [1].

It has been weighed that world consumes about 88 million barrels of petrol daily, while U.S. alone consume about 44% on cars fuel. According to international report affirm that oil theft in Nigeria is extremely high and disastrous which poses serious threat to the country national economy as the highest recognise source of income [2]. Pipeline vandalism is frequent occurrence issues in the petroleum sector for years, and several countermeasures technique have been deployed varies from different technology approaches. Initial proactive measure provided are security agent deployment (policemen, para-military patrol teams and non-governmental securities) and automation based intelligent system. This has yielded inadequate result due to some difficult terrain of oil pipeline networks location coupled with other criminal strategies adopted by those vandals of oil pipeline.

Furthermore, wireless technology based internet of things render services of a remote data transfer, sensing, monitoring and control. This technology is currently utilized to achieve various levels of intelligence in the embedded system applications. These include remote healthcare monitoring, transportation, building, environmental, agricultural, and oil pipeline monitoring [3].