SYNCHRONIZATION SCHEME FOR INFRASTRUCTURE IMPOVERISHED NETWORKS

This technology is an algorithm that presents a decentralized and self-organizing procedure for synchronizing communication networks without the requirement of a backbone infrastructure.
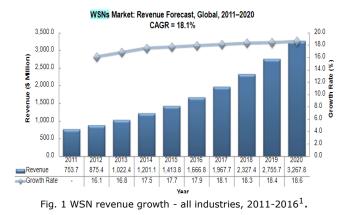
INVENTION

In the oil and gas industry, a large number of wireless geophones (in the order of thousands) are used to survey a geographical area. The current invention provides a method of synchronizing the internal clocks of the geophones to ensure data is transmitted with maximum efficiency. The procedure is light, produces high accuracy using a small number of communication exchange with other devices, uses only single hop communication and can function satisfactorily even when connectivity is unstructured and/or random. This algorithm is based on an energy-aware scheme and is highly suited to wireless sensor network implementations where network life is of utmost importance

MARKET SIZE AND GROWTH

Recent advances in computing, communication and micro-electromechanical technology have led the way to the utilization of wireless sensor networks in industrial setups. Industrial automation is one of the most important areas of WSN application. The global market share for WSN use in industrial setups lies at USD 11 billion and is increasing rapidly, owing mainly to the replacement of wired networks that required setup costs exceeding USD 100 billion.

According to ON world, there has been a rapid increase of wireless devices installed in industries during 2011-2016[2], at present more than 24 million wireless-enabled sensors, actuators and sensing points and deployed globally, with in-plant processes and oil and gas industry leading the way. Global market trends indicate a CAGR of 18.1% with revenues exceeding USD 3 Billion by 2020.

WSNs Market: Revenue Forecast, Global, 2011–2020
CAGR = 18.1%

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Revenue	753.7	875.4	1,022.4	1,201.1	1,413.8	1,666.8	1,967.7	2,327.4	2,755.7	3,267.8
Growth Rate	-	16.1	16.8	17.5	17.7	17.9	18.1	18.3	18.4	18.6

Fig. 1 WSN revenue growth - all industries, 2011-2016[1].

1. Frost & Sullivan
2. Wireless sensor network market, ON World

APPLICATION

This invention applies to wireless geophone networks that operate with largescale implementations. Since this is just the synchronization algorithm, it can be applicable in any wireless sensor device.

ADVANTAGES

This algorithm has the following main advantages over the existing ones:

- Autonomous synchronizion of large networks without the need of central command setup.
- Energy efficiency for higher network operating time.

PROJECT STATUS

This invention in its current form has been designed and simulated on a software test bench. The designed algorithm has also been tested on a group of 5 MicaZ wireless sensor nodes and successful operation of the synchronization process has been demonstrated.

LOOKING FOR A DEVELOPMENT PARTNER

Although the devised protocol has been proven at the lab scale, it has not yet been tested under the implementation of proper MAC and routing protocols. This is a necessary step to ensure the synchronization protocol does not hinder the packet reception/transmission process. In order to proceed further, the first step would require the present invention be operated under existing, energy-efficient MAC and routing protocols. This may require re-engineering the MAC and routing protocols to include the present algorithm for synchronization purpose.

PATENT PROTECTION

A U.S. patent pending application: US15/825698

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