

WIDE AREA NETWORK FOR OFFENDER TRACKING

DESCRIPTION

BACKGROUND OF THE INVENTION

Electronic Monitoring System (EMS) has been widely used in home detention night-time curfew. The system consists of an ankle tracking tag, a home monitoring unit (HMU), and a control center. The HMU is installed in the home of the offender to monitor the present of the tracking tag on the offender's ankle. It has a wireline or wireless connection to the control center. A curfew violation will be triggered if the offender's present is not detected during the curfew hours. The tag is protected by anti-tampering mechanism. If tampering is detected, an alert will be send to control center. The present system has two limitation. First, the communication range of the tag and HMU is limited. There is a risk that the offender can remove the tag by cutting the strap unnoticed. If the tag is not within the range of the designated HMU, the alert will not be able to send to the control center. The second one is the location of the offenders can not be known once they move out of range of the paired HMU. A cellular GPS tag will be able to solve these two limitation but it is more bulky and has a battery life of only one day.

BRIEF SUMMARY OF THE INVENTION

In order to solve these two limitations, first a new radio communication technology must be used to extent the range. By using spread spectrum technology, the range of the HMU and tag can be increased to a few kilometres from less than a hundred meters. Another new technology to be included is the multi-channel concurrent decoding technique. Each HMU is installed with a multi-channel receiver that can receive signal from any tags around its vicinity simultaneously. In Singapore, on average there is more than one HMU per every two kilometres square. With this huge installed base, there will be more than one HMU within one kilometre radius of every tag on this island. Hence, with this new network, the tampering alert will be sent to control center immediately relying on any HMU around it. The location of the tag can also be estimated from the HMU relying the message or GPS location from the tag itself. Figure 1 shows the working state of the tracking tag.

BRIEF DESCRIPTION OF THE DRAWING

FIG 1. is a state diagram of the operational mode of the tracking tag.

DETAIL DESCRIPTION OF THE INVENTION

There are two parts in this invention; the tracking tag and HMU. There are two communication modes used; short range mode with frequency shift keying (FSK) and long range mode with spread spectrum (SS). The new tag is mounted with single channel radio transceiver which supports both short range and long range radio transmissions. The home monitoring unit (HMU) on the other hand is mounted with a multichannel radio transceiver that one channel is set to short range and the rest of the channels are set to long range. The tag transmit a unique beacon (UB) signal periodically to its paired HMU in short range mode. If the paired HMU receives this UB signal, it will response with an acknowledgement (ACK) signal and at the same time notify control center that the paired tag is within range. When the tag receives the ACK, it will stay in the short range mode and using only short range channel to communicate. When the tag move out of the range, it won't be able to receive the ACK signal from the HMU. After a time out, it will then switches to long range mode. In long range mode, the tag will send out a geolocation message (GM) signal in one of the long range channel periodically. The long range channel number is selected randomly to avoid continuous collision with any other tag nearby. The tag will still continue sending its periodic UB signal to check if it goes back to the paired HMU. If the tag is equipped with GPS, the geolocation message will have GPS location info of the tag and time stamp.

If any HMU in the vicinity pick up the GM signal, it will forward this to the control center. With this design, the control center will be able to monitor the status of the tag even though the offender has moved out of range from the paired HMU.

CLAIMS

What is claimed is:

1. A wide area offender tracking network for use to enforce the curfew and track the whereabouts of the offender when they are outside their home, comprising:
 - a tracking tag to be worn on each offender which has a short range a radio transceiver supporting short range and long range radio communication, where it uses short range radio communication inside the home of the offender and long range radio communication when it is out of the home;
 - a home monitoring unit to be installed in the home of each offender and electronically paired with the tracking tag on the offender which has a multichannel radio transceiver that one channel is set to short range radio communication and the rest of the channels are set to long range radio communication where the short range radio communication channel is used to communicate with the paired tracking tag and the long range radio communication channels are used to communicate with any tag near by; and
 - a control center that track the tag location by analysing the message sent back from all the tracking tags through the home monitoring units.
2. The tracking tag recited in claim 1, further comprising:
 - a GPS receiver will include its location information in its communication with the control center when it is outside the home of the offender.

