FORTH

TRAFFIC SYSTEM

FORTH – ATC

Area Traffic Control

AT-001-B

Traffic Network Signal Control System

Genius Traffic System

Genius Traffic System Co., Ltd. is a researcher, a developer, and a manufacturer of the standard traffic devices such as LED signal heads, traffic countdown signs, and traffic signal controllers, which are trusted to install these traffic signal devices for the Bangkok Metropolitan Administration, the Department of Highways, the Department of Rural Roads, the Local Municipalities, and other government agencies throughout Thailand. This is an evidence of proof that we are the leader of the traffic signal system developer with high international caliber.

FORTH – ATC

FORTH-ATC is a traffic control system that synchronizes signalized intersections in a network by increasing the likelihood of no stops for incoming vehicles to the signalized network. In other words, the system maximizes the so-called "Greenband" or "Greenwave" for traffic on corridors in the network. Signal controls for each intersection are either pretimed programmed or automatically adjusted according to the detected traffic demand. Offsets are set to reflect to the synchronization of all intersections in the network.

Automatic Traffic Control

Traffic Signal Controls can be categorized into three categories.

• **Fixed Time Signal** is a system that utilizes the processed historical data to preset the signal timing into several plans for different time of day, day of week, and special incidents.

• **Vehicle Actuated** Signal is a system with traffic detectors installed at intersections to collect traffic demand. Signal timing will be given to the phases with vehicle actuation until queue is cleared or the maximum green time is reached. In case of no vehicle actuation, green times will be shortened. This type of signal control is widely used on highways.

• **Adaptive Signal Control System** is the one with traffic detectors to process and predict incoming traffic demand. Signal timings are adjusted to reflect the fluctuation of future traffic demand.

FORTH – ATC

Maximum Efficient Traffic Management at Intersections

In general, existing traffic signal controls used in Bangkok and other areas in Thailand are the pretimed system, which cannot automatically adjust the timing to the change of traffic volumes. This can lead to lost green times or excessive long queues due to insufficient green times. Therefore, installation of the traffic signal control systems that can adjust the timing according to traffic demand is the key to efficiency traffic management. This type of systems is widely utilized in England, Europe, Australia, USA, and Japan. Thailand has recently deployed the systems at several locations such as Chaing-Mai, Pattaya, Hat-Yai, and Nonthaburi, which can appropriately synchronize traffic signals among intersections in the network.
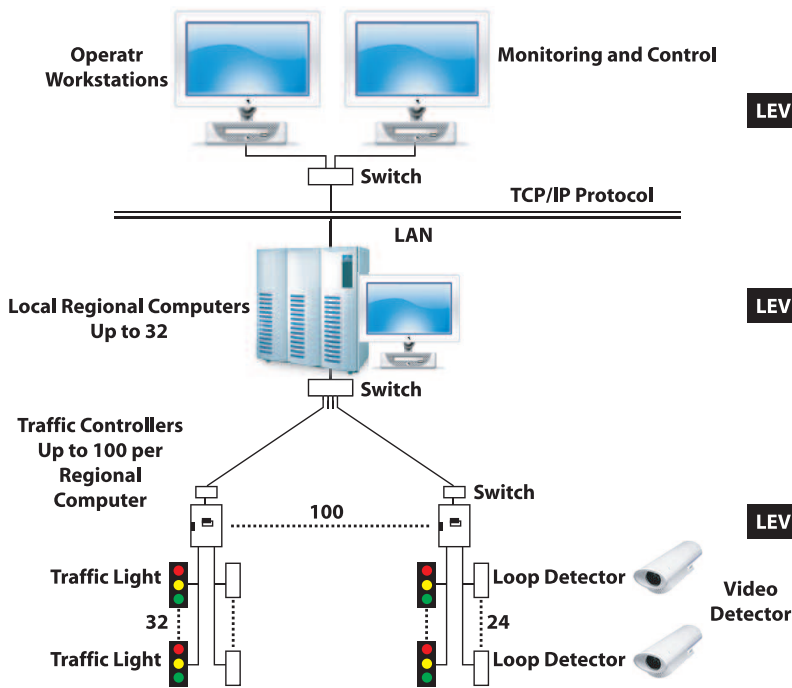

Principles of FORTH-ATC

Area traffic control (ATC) systems process signal timing plans according to traffic demand throughout the day. However, the existing ATC systems in Thailand are a pre-timed control with fixed timing plans. These systems therefore cannot efficiently accommodate the certainties of traffic demand fluctuation. The engineers of FORTH-ATC have researched and developed the area traffic control systems that can adjust signal timing according to traffic demand, which certainly leads to efficient traffic management in general.

FORTH - ATC

FORTH-ATC System

Operatr Workstations

Monitoring and Control

LEVEL 1

Switch

TCP/IP Protocol

LAN

Local Regional Computers Up to 32

LEVEL 2

Switch

Traffic Controllers Up to 100 per Regional Computer

Switch

100

LEVEL 3

Traffic Light

32

Traffic Light

Loop Detector

24

Loop Detector

Video Detector

FORTH-ATC has main components:

1. Traffic Detection System

Traffic detectors collect traffic demand information and are linked with controllers. Traffic information is transmitted to the central computer at the control center and is processed to determine optimal signal timing.

2. Central Processing Unit consists of three elements

A. Cycle Length Determination:

FORTH-ATC engineers and researchers use Fuzzy Logic Control to determine cycle lengths for each intersection in the network. The notion of the Fuzzy logic is based on the uncertainties in traffic detection and data learning process to reflect the change of traffic demand detected throughout the day by maintaining consistency of volume-to-capacity of intersections. Minimum and maximum cycle lengths are set to prevent system errors.

B. Split Calculation:

phase splits are calculated using the concept of equalizing degree of saturation among competing phases. This concept is proposed in the U.S. Highway Capacity Manual 2000 to provide optimal signal splits.

C. Offset Calculation:

offset is the time difference of green initiation of intersections in the network compared to that of the master intersection. Offsets are set to maximize the green bandwidth without deteriorating traffic conditions on side streets. FORTH-ATC uses the mathematical technique called mixed-integer linear programs (MILP) to obtain optimal offsets.
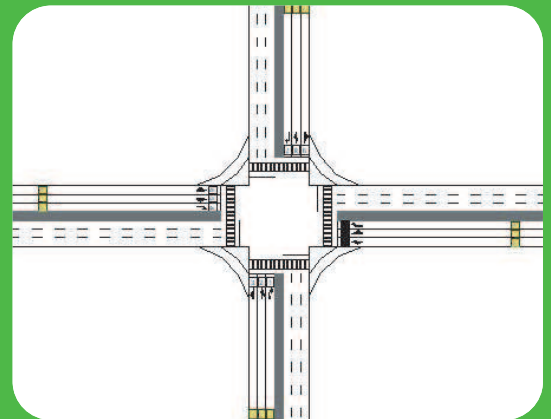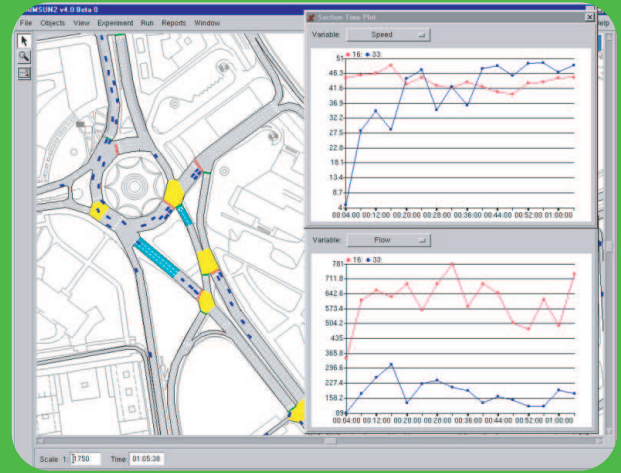

FORTH - ATC

FORTH-ATC System

### 3) User Interface and Traffic Condition Reporting System

• There is a Graphic User Interface (GUI) in Thai language which is user-friendly.

• Real-time traffic condition report: data from traffic detectors, system status, and signal timing in the next cycle.

• Users can control any intersections from this system in the control room.

• Keep historical traffic data so that users can retrieve data and present data in graphic formats.

Advantages of the System

1) FORTH-ATC is designed to continuously detect and optimize signal timing in accordance with the change of traffic demand.

2) FORTH-ATC can report current traffic conditions by processing data from detectors.

3) FORTH-ATC is developed by Thai engineers with good understandings of traffic congestion problems in Thailand by taking into account of Thai traffic conditions and driving behaviors.

4) FORTH-ATC has a control system at the control center. In case of emergency, any intersections can directly be controlled from the control center.

5) FORTH-ATC is designed with the concept of system expansion. Therefore, no entire system upgrade is required for a system expansion.

6) FORTH-ATC can help reduce travel times and number of stops at signalized intersections. Therefore, it can help reduce fuel consumption rates for road users.

7) FORTH-ATC is designed with good GUI. It is user-friendly for system controllers.
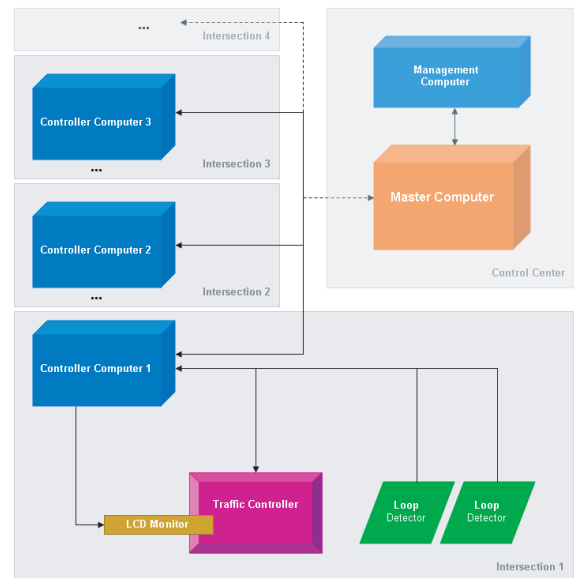
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