

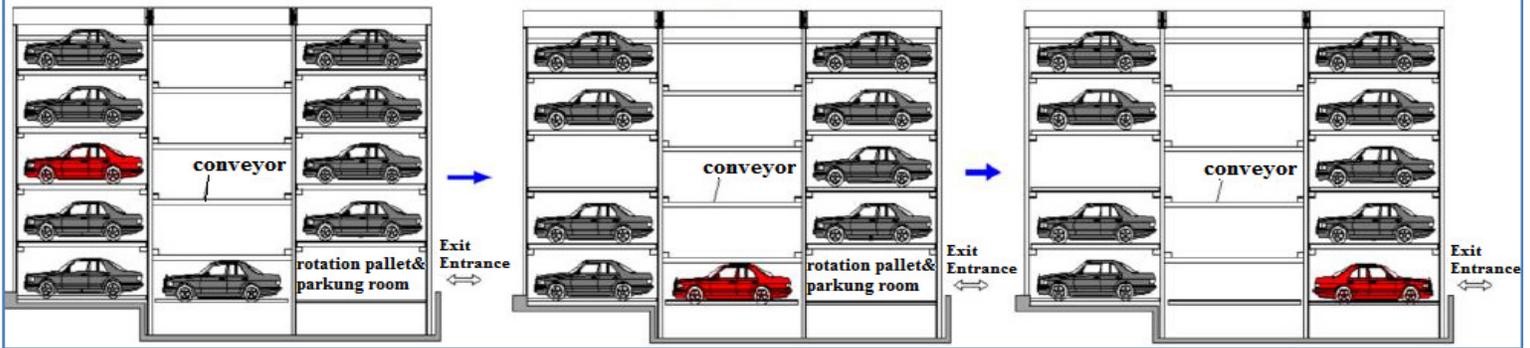
B.Sc. Project for 2016/2017

Design of a Smart Car Parking Model Using PLC Systems

Supervisor A. Prof. Mohsen Soliman (ACC Manager)

Introduction:

Dealing with car parking problems in crowded cities has become a major recent concern due to both limited availability of parking spaces & complicated management & traffic control tasks. Now, there are many types of smart parking systems. This Project is an example for design of a Smart Car parking system using recent concepts of sequential automatic control by PLC System that uses selective/parallel branching. Next Fig. shows the concept of a Smart Parking multi-store building.

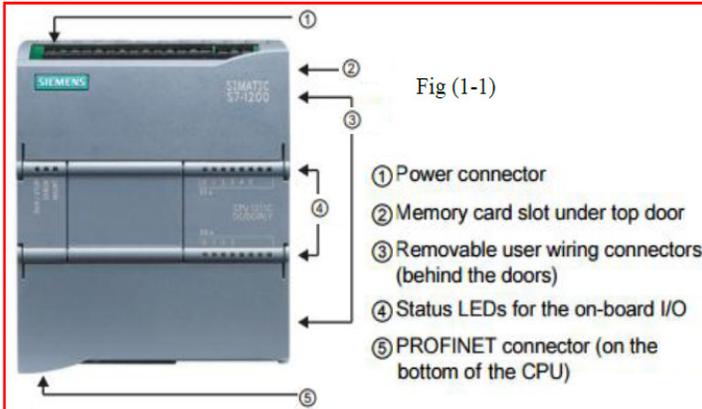


Parking Steps: The car in red color is to be unparked. PLC Smart Parking System need to be automatically instructed & controlled do the following actions to unpark this car (using proper sensors, mech., Hydraulic/Pneumatic & electric Input/output equipment):

1-The convey pallet in the same level with red car slides to the fully back of red car, then the conveyor conveys a Mini message: red car to the pallet. 2-The convey pallet with the red car slides to the adjacent position with the elevator, and then puts the red car on elevator. 3-The elevator shift down to the ground level to the exit of the car (center figure). 4-Convey pallet conveys the car to parking room. 5-The rotation pallet has to rotate to turn the ca, to ensure the front of the car is outward.

The features of this System include: A-There is no need of ramp, so that we can save land area and the vertical parking capacity density is big to take full use of the available space. B-Park/unpark is automatic and easy and is done by a button press. C-The most suitable building place is underground parking garage with long laneway & not too many levels. D- it is equipped with all needed safety protection devices to ensure safety and reliability and to avoid various accidents and addition to fire fighting protection. E- This system adopts photoelectric safety inspection to control the dimension and the quantity of parking cars. F- This system does not, generally, need forced ventilation and there is no large area lighting so it shall also save energy.

Applicable Occasion: most suitable place for this system is the large & medium-sized buildings or public facilities; it can be designed according to available vertical & horizontal spaces. The PLC system available for use in the project is shown on fig1-1.



➤ Main Unit (Fig 1-1) Specifications

CPU	S7-1200 CPU 1214C DC/DC/DC
Supply voltage	24 VDC
Available project memory/user memory	50 Kbyte
integrated channels (DI) Digital Inputs	14
integrated channels (DO) Digital Outputs	10
Integrated channels (AI) Analogue Inputs	2
Type of interface	PROFINET
Configuration software	SIMATIC basic (Tia portal)
Programming language	FBD-LAD
inputs usable for technological functions	6 HSC (High Speed Counting)
high-speed outputs	2 100 kHz Pulse Train Output

Project Requirements: After selecting specific model/type for car parking multi-store building, the flowing tasks has to be done: 1-Design SFC(sequentialfunctionchart) for any random carto park/unparkin thebuilding. 2-Therequiredsensors&Input/output field devices have to be defined. 3-Convert the SFC intoLAD diagram for the PLC S7-1200(using Siemens software SimaticTIA portal V13). 4-Test&do all diagnostics for theLAD&perform requiredsoftware Simulation(i.e,withoutusingaPLC). 5-Dothe PLC-wiring diagram to connect all hardware. 6-Build aProjectboard(e.g., typical to shown above figure) to present the correct operation of the project. 7-The board should include required LEDs and output display tools to show the accurate park/unpark for any random car.

المشرف على المشروع: أ.م/ محسن سيد سليمان

مدير معمل التحكم ACC ومنسق إدارة دبلوم التحكم- مديروحدة ضمان الجودة في القسم ومرشد أكاديمي د.ع.