'11. 9. 15, Presentation #1

Robot Vacuum Cleaner
(SA Supplement)

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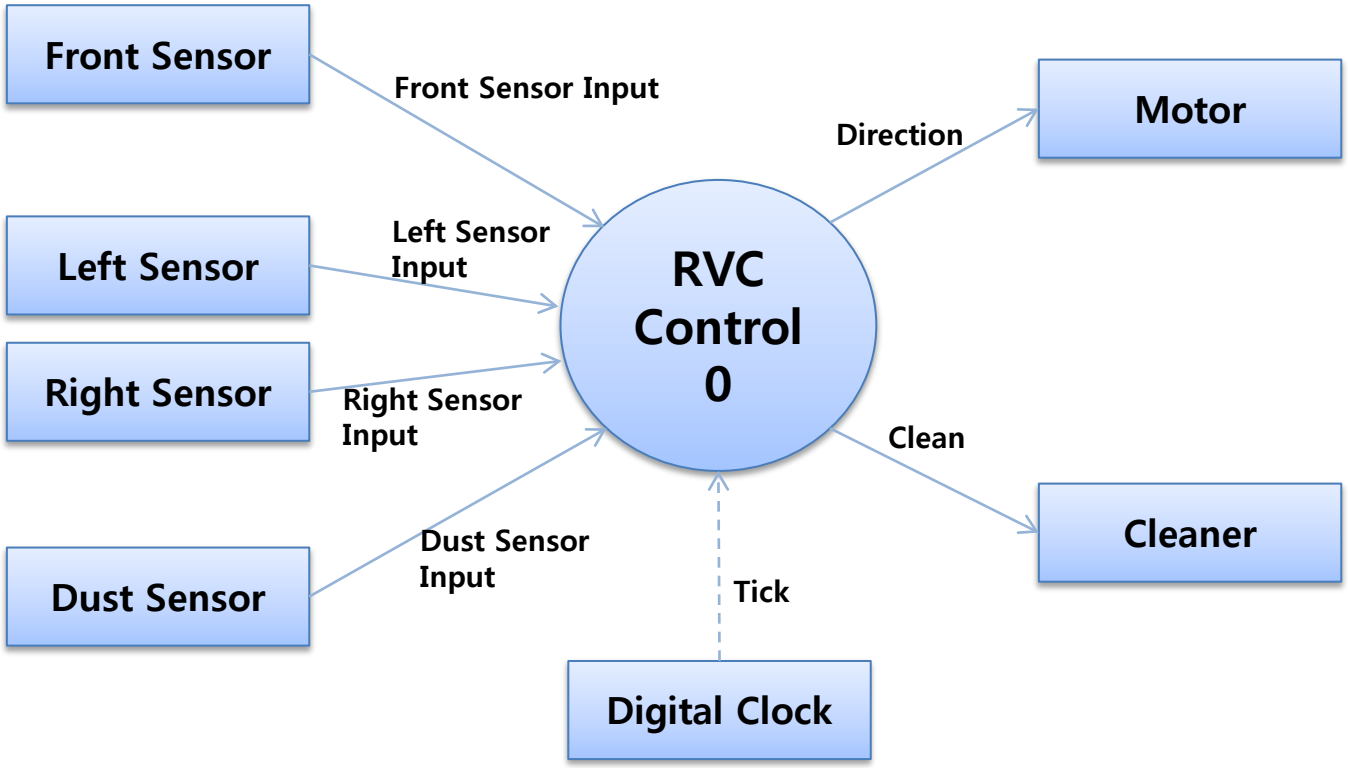
Statement of Purpose – RVC

Robot Vacuum Cleaner (RVC)

- An RVC automatically cleans and mops household surface.
- It goes straight forward while cleaning.
- If its sensors found an obstacle, it stops cleaning, turns aside, and goes forward with cleaning.
- If it detects dust, power up the cleaning for a while
- We do not consider the detail design and implementation on HW controls.
- We only focus on the automatic cleaning function.

DFD Level 0

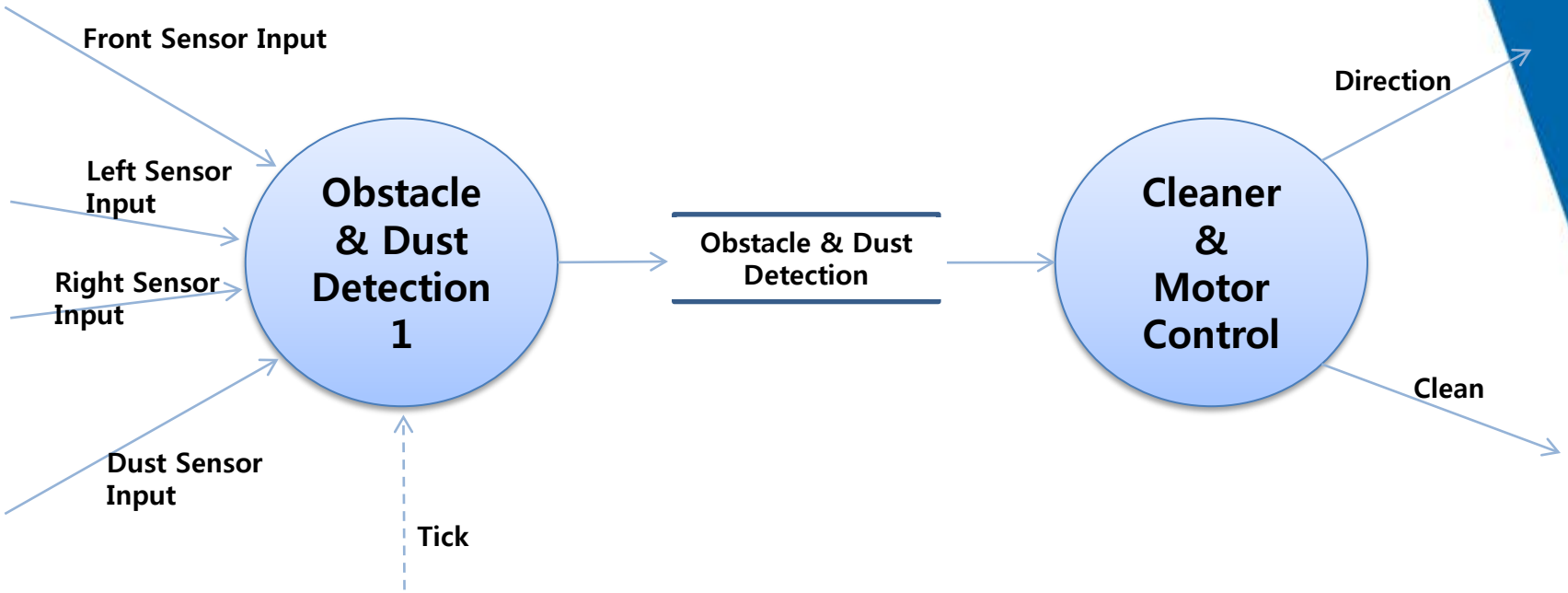

Front Sensor
Left Sensor
Right Sensor
Dust Sensor
Front Sensor Input
Left Sensor Input
Right Sensor Input
Dust Sensor Input
RVC Control 0
Direction
Clean
Tick
Motor
Cleaner
Digital Clock

DFD Level 0

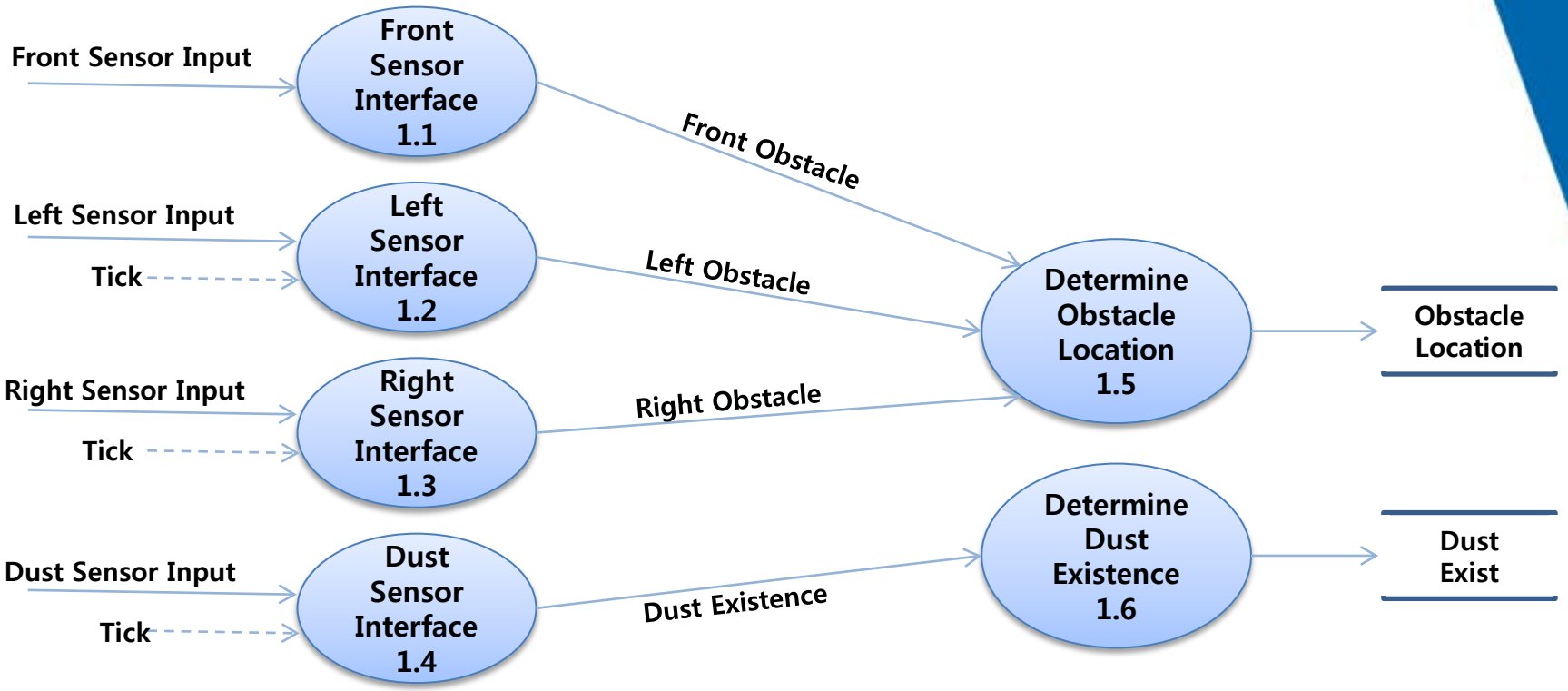
◆ Data Dictionary

Input / Output Event	Description	Format / Type
Front Sensor Input	RVC 앞의 장애물을 감지한다	T / F , Interrupt
Left Sensor Input	RVC 왼쪽의 장애물을 주기적으로 감지한다	T / F , Periodic
Right Sensor Input	RVC 오른쪽의 장애물을 주기적으로 감지한다	T / F , Periodic
Dust Sensor Input	RVC 아래에 먼지가 있는지 주기적으로 감지한다.	T / F , Periodic
Direction	Motor의 이동방향을 지시한다.	Forward / Left / Right / Stop
Clean	Turn off / Turn on / Power-Up	On / Off / Up

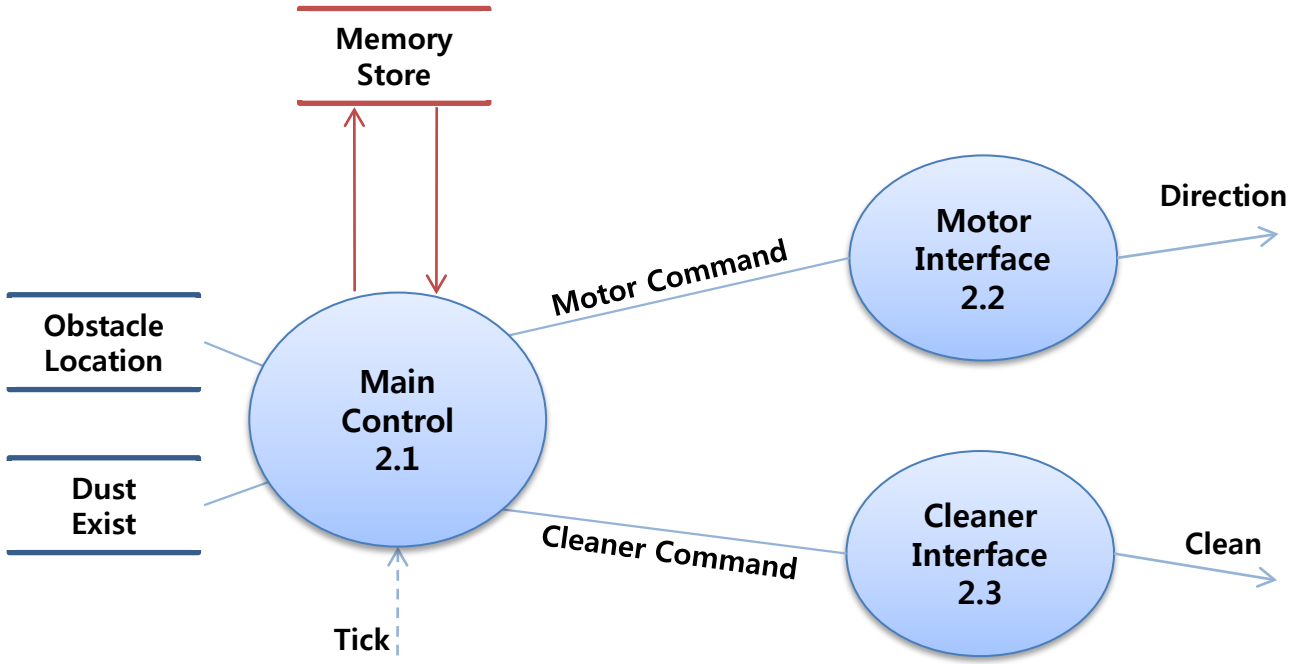
DFD Level 1


Front Sensor Input
Left Sensor Input
Right Sensor Input
Dust Sensor Input
Obstacle & Dust Detection 1
Tick
Obstacle & Dust Detection
Cleaner & Motor Control
Direction
Clean

DFD Level 2


Front Sensor Input
Front Sensor Interface 1.1
Front Obstacle
Left Sensor Input
Tick
Left Sensor Interface 1.2
Left Obstacle
Right Sensor Input
Tick
Right Sensor Interface 1.3
Right Obstacle
Dust Sensor Input
Tick
Dust Sensor Interface 1.4
Dust Existence
Determine Obstacle Location 1.5
Obstacle Location
Determine Dust Existence 1.6
Dust Exist

DFD Level 2

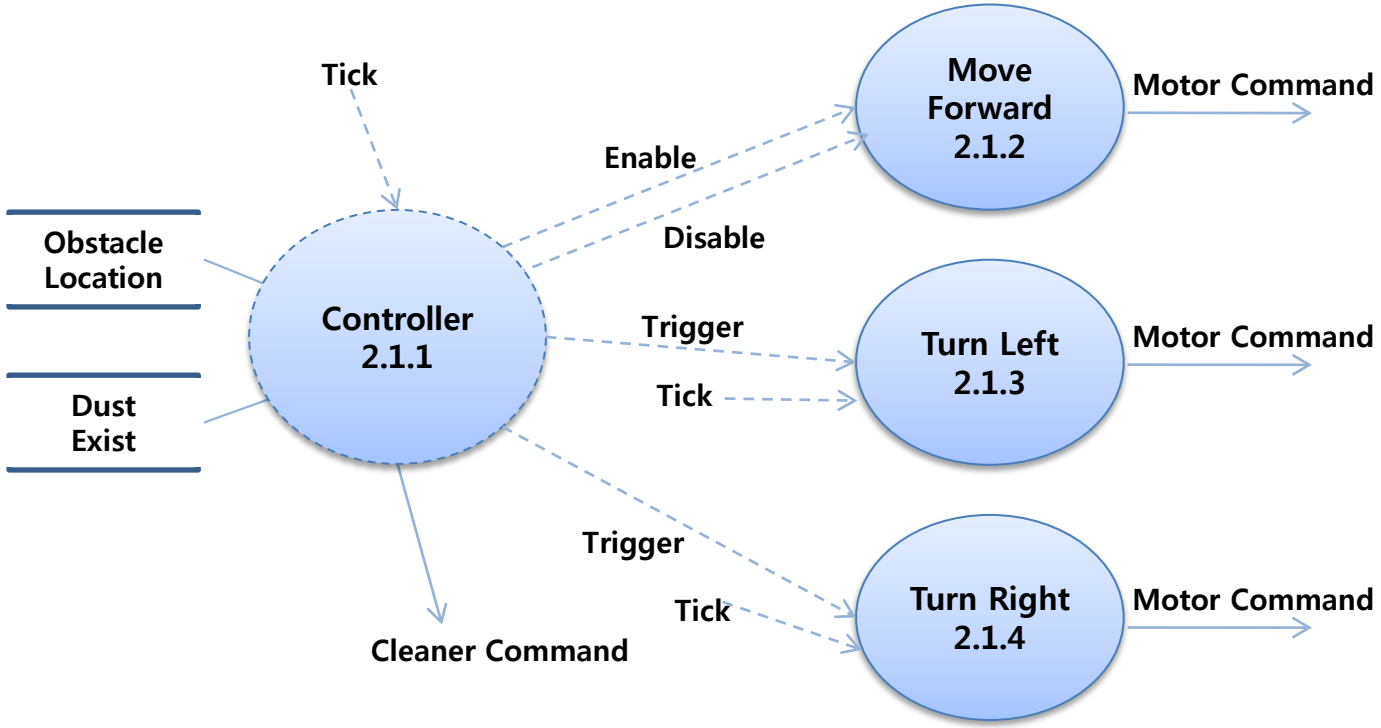


◆ Data Dictionary

Input / Output Event	Description	Format / Type
Memory Store	RVC가 지나간 길과 장애물의 위치를 저장한다.	Data Structure

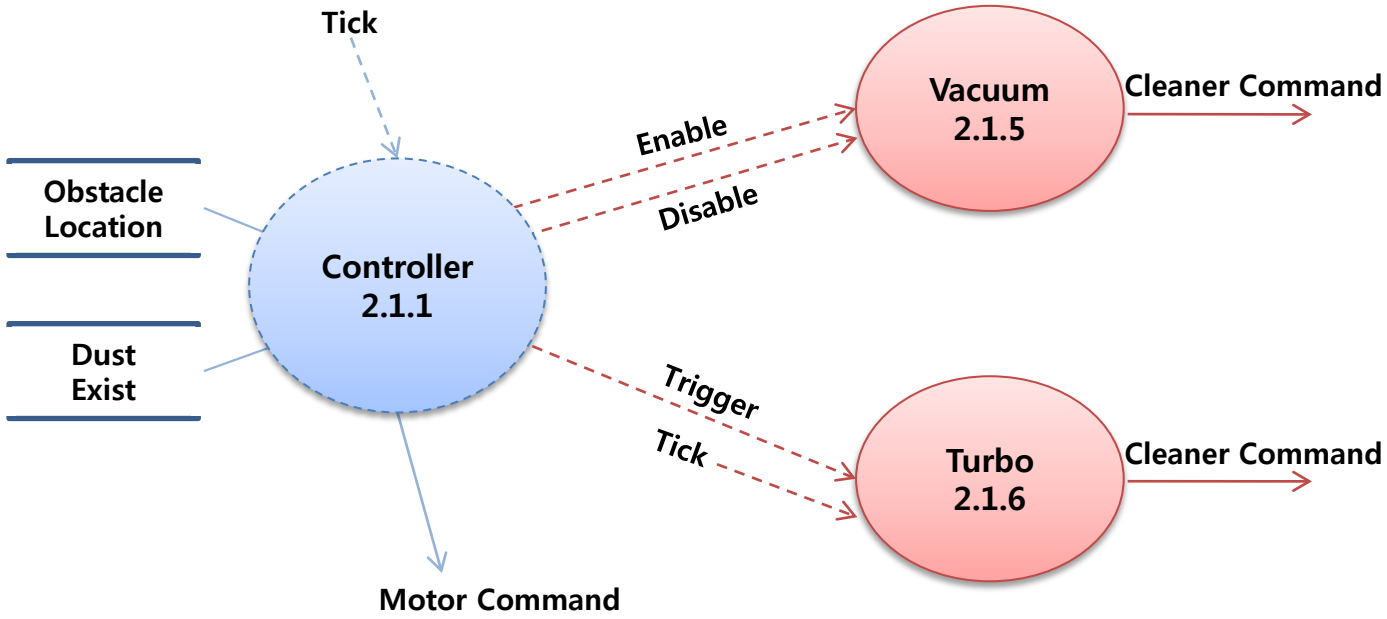
DFD Level 3

- Motor command



DFD Level 3

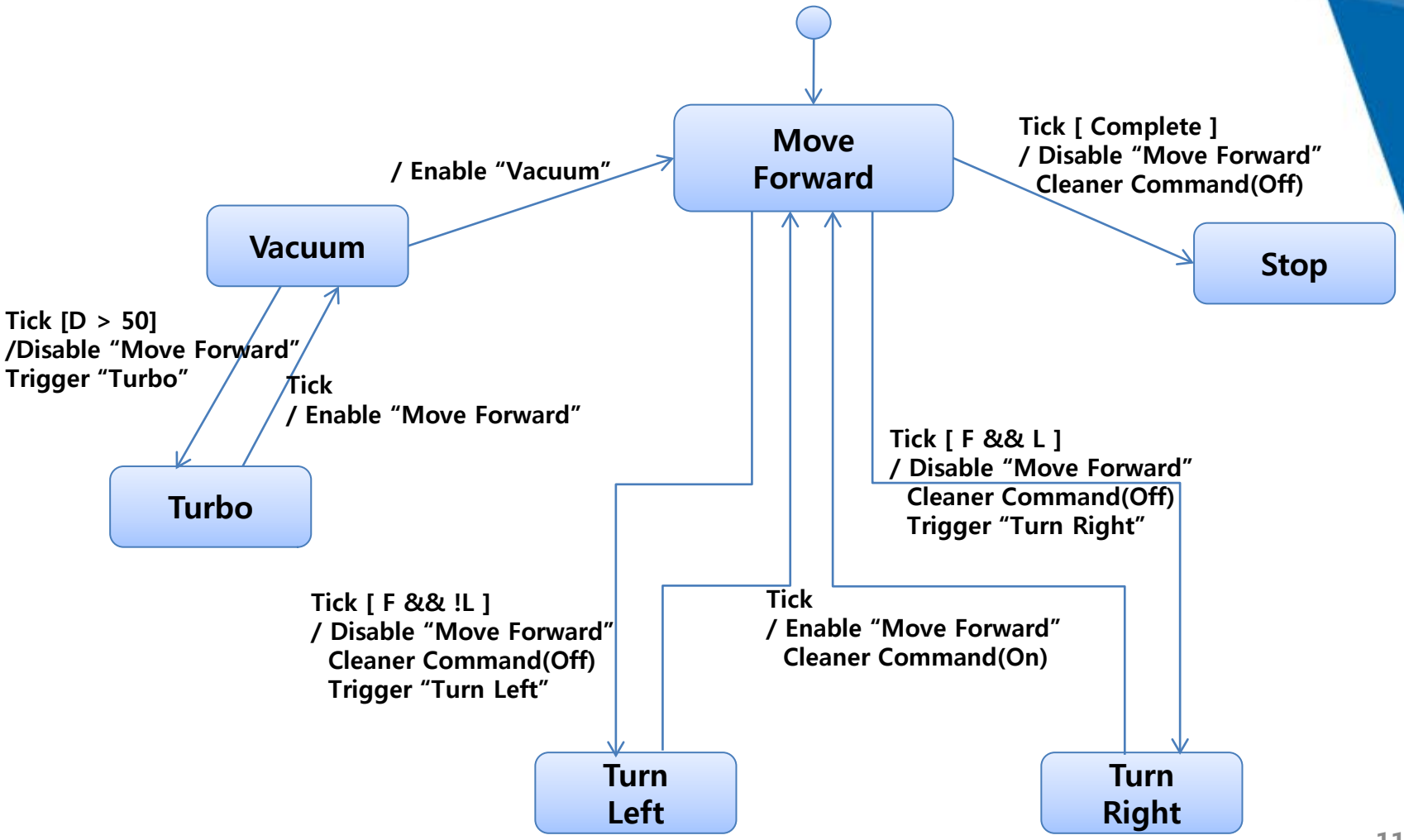
- Cleaner command



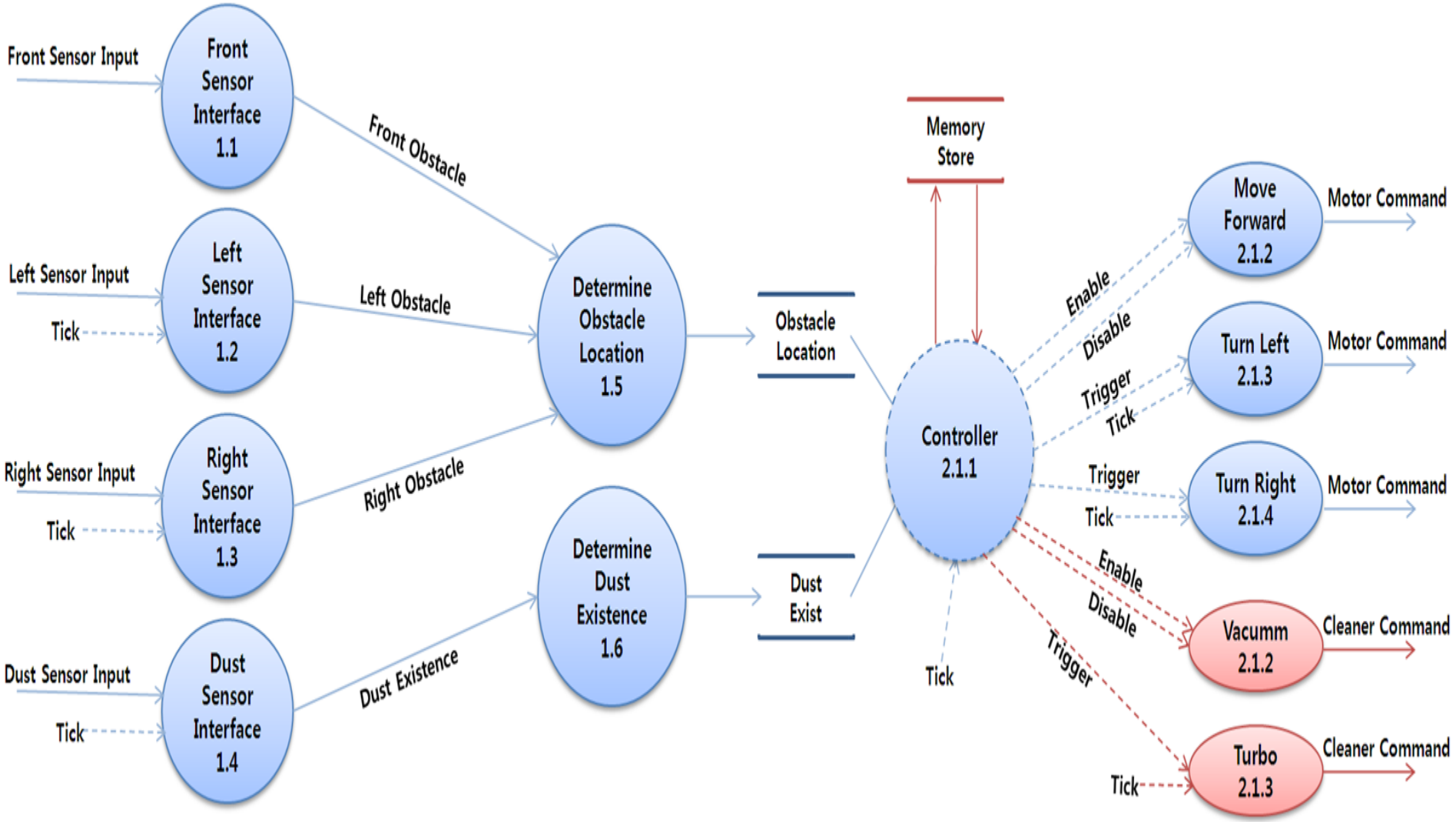
◆ Data Dictionary

Input / Output Event	Description	Format / Type
Vacuum	청소 수행여부	True / False , Interrupt
Turbo	흡입력 조절	True / False , Periodic

DFD Level 4


Move Forward
/ Enable "Vacuum"
Vacuum
Tick [Complete]
/ Disable "Move Forward"
Cleaner Command(Off)
Stop
Tick [D > 50]
/Disable "Move Forward"
Trigger "Turbo"
Tick
/ Enable "Move Forward"
Turbo
Tick [F && L]
/ Disable "Move Forward"
Cleaner Command(Off)
Trigger "Turn Right"
Tick [F && !L]
/ Disable "Move Forward"
Cleaner Command(Off)
Trigger "Turn Left"
Tick
/ Enable "Move Forward"
Cleaner Command(On)
Turn Left
Turn Right

DFD


Front Sensor Input
Front Sensor Interface 1.1
Front Obstacle
Left Sensor Input
Tick
Left Sensor Interface 1.2
Left Obstacle
Right Sensor Input
Tick
Right Sensor Interface 1.3
Right Obstacle
Dust Sensor Input
Tick
Dust Sensor Interface 1.4
Dust Existence
Determine Obstacle Location 1.5
Determine Dust Existence 1.6
Obstacle Location
Dust Exist
Memory Store
Controller 2.1.1
Tick
Enable
Disable
Trigger
Tick
Move Forward 2.1.2
Motor Command
Turn Left 2.1.3
Motor Command
Trigger
Tick
Turn Right 2.1.4
Motor Command
Enable
Disable
Vacumm 2.1.2
Cleaner Command
Trigger
Tick
Turbo 2.1.3
Cleaner Command

Process Specification

Reference No.	1.1
Name	Front Sensor Interface
Input	Front Sensor Input
Output	Front Obstacle (Interrupt)
Process Description	Analog 형식의 Front Sensor Input이 들어오면 Digital 형식의 Enable / Digital로 바꾼 후 Output으로 Front Obstacle을 보내준다.

Reference No.	1.2
Name	Left Sensor Interface
Input	Left Sensor Input , Tick
Output	Left Obstacle (bool)
Process Description	Analog 형식의 Left Sensor Input이 들어오면 Digital 형식의 True / False로 바꾼 후 Output으로 Left Obstacle을 보내준다.

Process Specification

Reference No.	1.3
Name	Right Sensor Interface
Input	Right Sensor Input , Tick
Output	Right Obstacle (bool)
Process Description	Analog 형식의 Right Sensor Input이 들어오면 Digital 형식의 True / False로 바꾼 후 Output으로 Right Obstacle을 보내준다.

Reference No.	1.4
Name	Dust Sensor Interface
Input	Dust Sensor Input , Tick
Output	Dust Existence (integer)
Process Description	Analog 형식의 Dust Sensor Input이 들어오면 Digital 형식의 Integer로 로 바꾼 후 Output으로 Dust Existence을 보내준다.

Process Specification

Reference No.	1.5
Name	Determine Obstacle Location
Input	Front Obstacle(bool), Left Obstacle(bool), Right Obstacle(bool)
Output	Data Structure
Process Description	Front , Left , Right 의 Input을 바탕으로 장애물 존재의 여부를 저장

Reference No.	1.6
Name	Determine Dust Existence
Input	Dust Existence(integer)
Output	Bool
Process Description	Input으로 들어온 integer가 일정 이상이면, True를 반환하고 그렇지 않으면 False를 반환한다.

Process Specification

Reference No.	2.1
Name	Main Control
Input	Data Structure, Tick
Output	Motor Command, Cleaner Command
Process Description	저장된 데이터로부터 Motor Command, Cleaner Command을 실행한다.

Reference No.	2.1.1
Name	Controller
Input	Obstacle Location, Dust Exist, Tick
Output	Enable, Disable, Trigger
Process Description	저장된 데이터를 받아, 동작 프로세스에 적절한 명령을 전달한다.

Process Specification

Reference No.	2.1.2
Name	Move Forward
Input	Enable, disable (interrupt)
Output	Motor Command
Process Description	Move할 것인지를 True / False로 받아 동작할 지의 여부를 결정한다.

Reference No.	2.1.3
Name	Turn Left
Input	Trigger, Tick
Output	Motor Command
Process Description	Trigger 명령이 들어오면, 다음 Tick까지 Turn Left 한다.

Process Specification

Reference No.	2.1.4
Name	Turn Right
Input	Trigger, Tick
Output	Motor Command
Process Description	Trigger 명령이 들어오면, 다음 Tick까지 Turn Right 한다.

Reference No.	2.1.5
Name	Vacuum
Input	Enable, Disable (Interrupt)
Output	Cleaner Command
Process Description	Clean할 것인지를 True / False로 받아 동작할 지의 여부를 결정한다.

Process Specification

Reference No.	2.1.6
Name	Turbo
Input	Trigger, Tick
Output	Cleaner Command
Process Description	Trigger 명령이 들어오면, 다음 Tick까지 강도를 증가시킨다.

Thank You!!