STRUCTURED ANALYSIS & STRUCTURED DESIGN

Final Demo

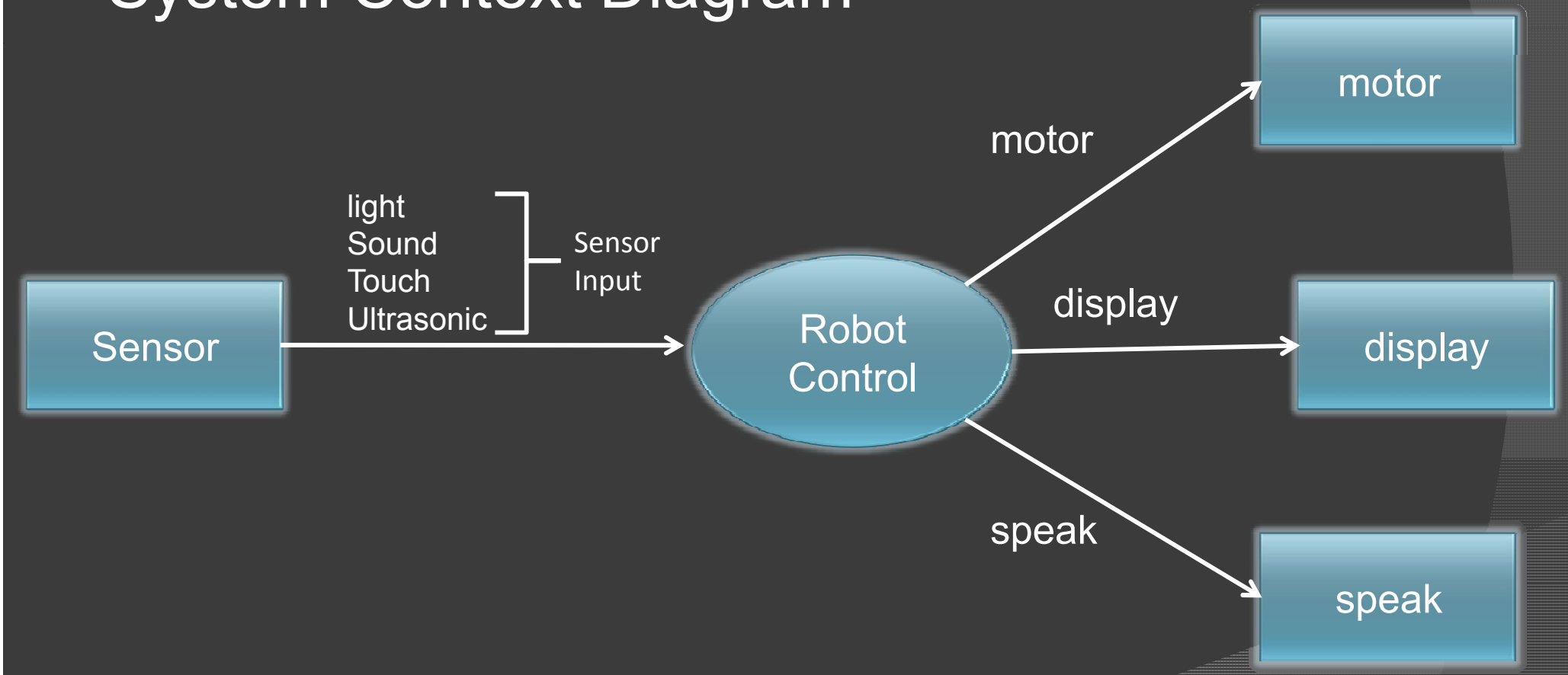
T12

200518036 곡진화
200611507 이지성
200960160 고박우
200960163 장 권

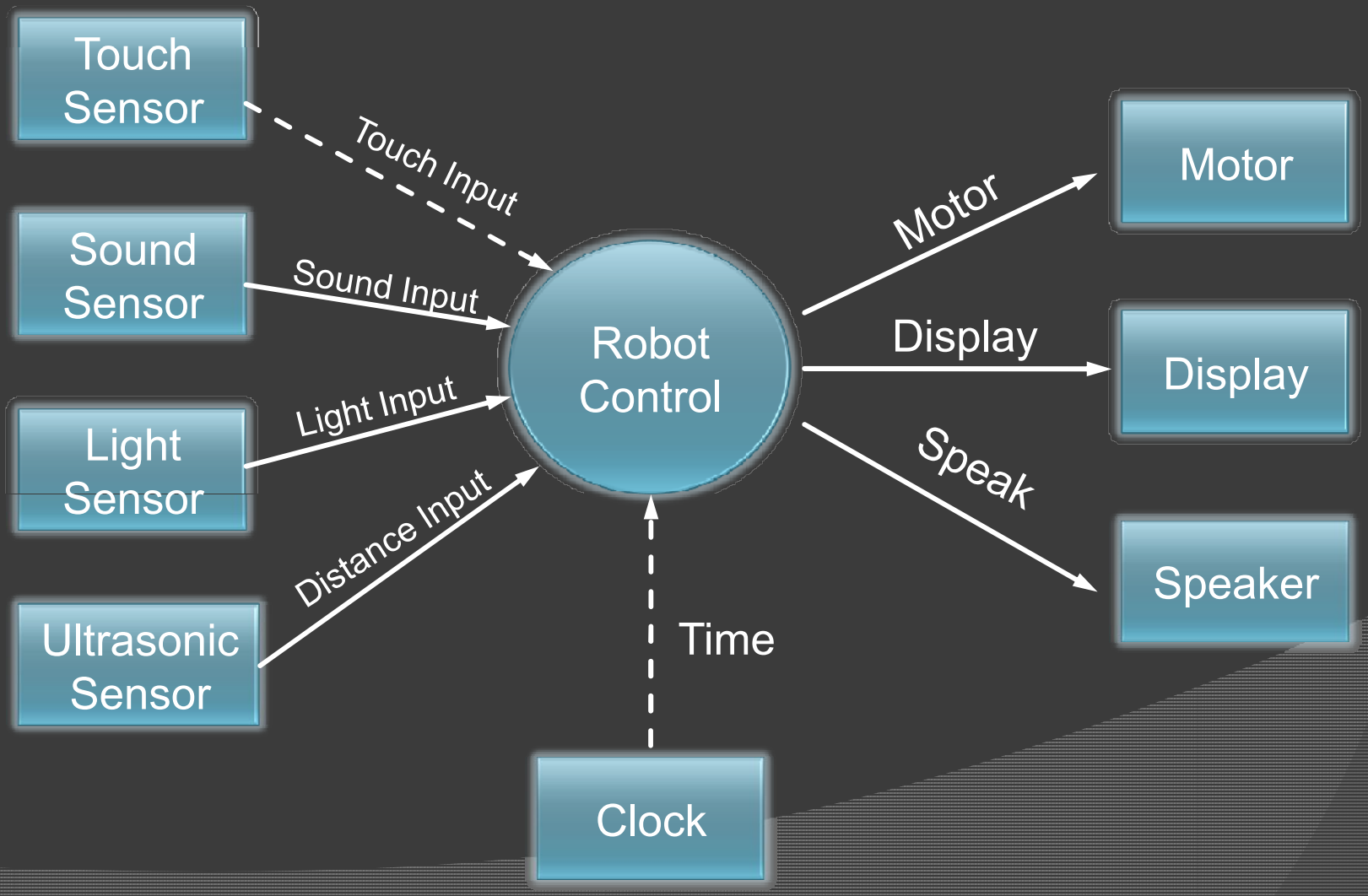
Structured Analysis

Structured Analysis

System Context Diagram



Structured Analysis
DFD Level 0



Structured Analysis

DFD Level 0--Information

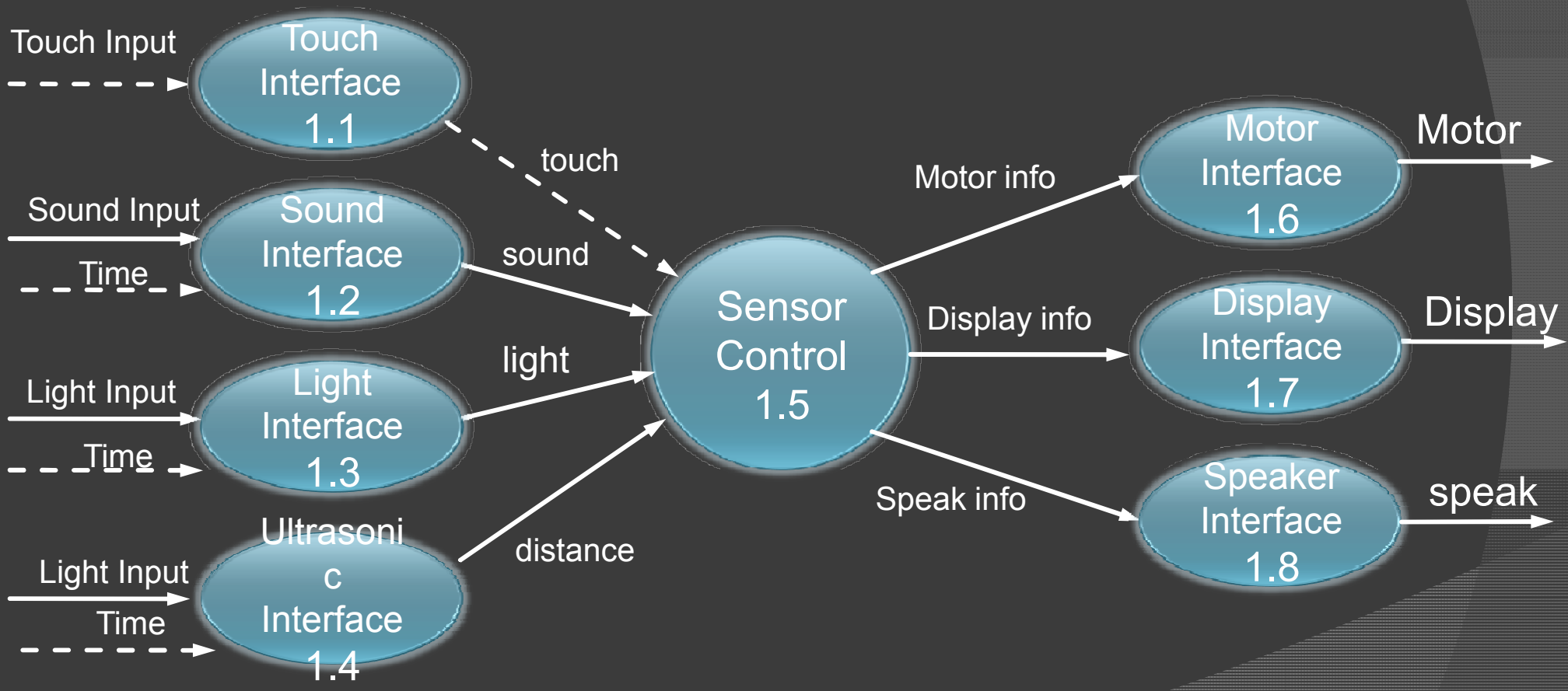
Input Event	Description	Format/Type
Touch Input	Detects a touch, whenever the robot hits an object	True/False Interrupt
Sound Input	Detects ambient sound	Int/Periodic
Light Input	Detects ambient light	Int/Periodic
Distance Input	Detects exact distances between robot and obstacles	Int/Periodic
Time	Ticks in increments of 1/1000 of a second	trigger/Interrupt

Structured Analysis

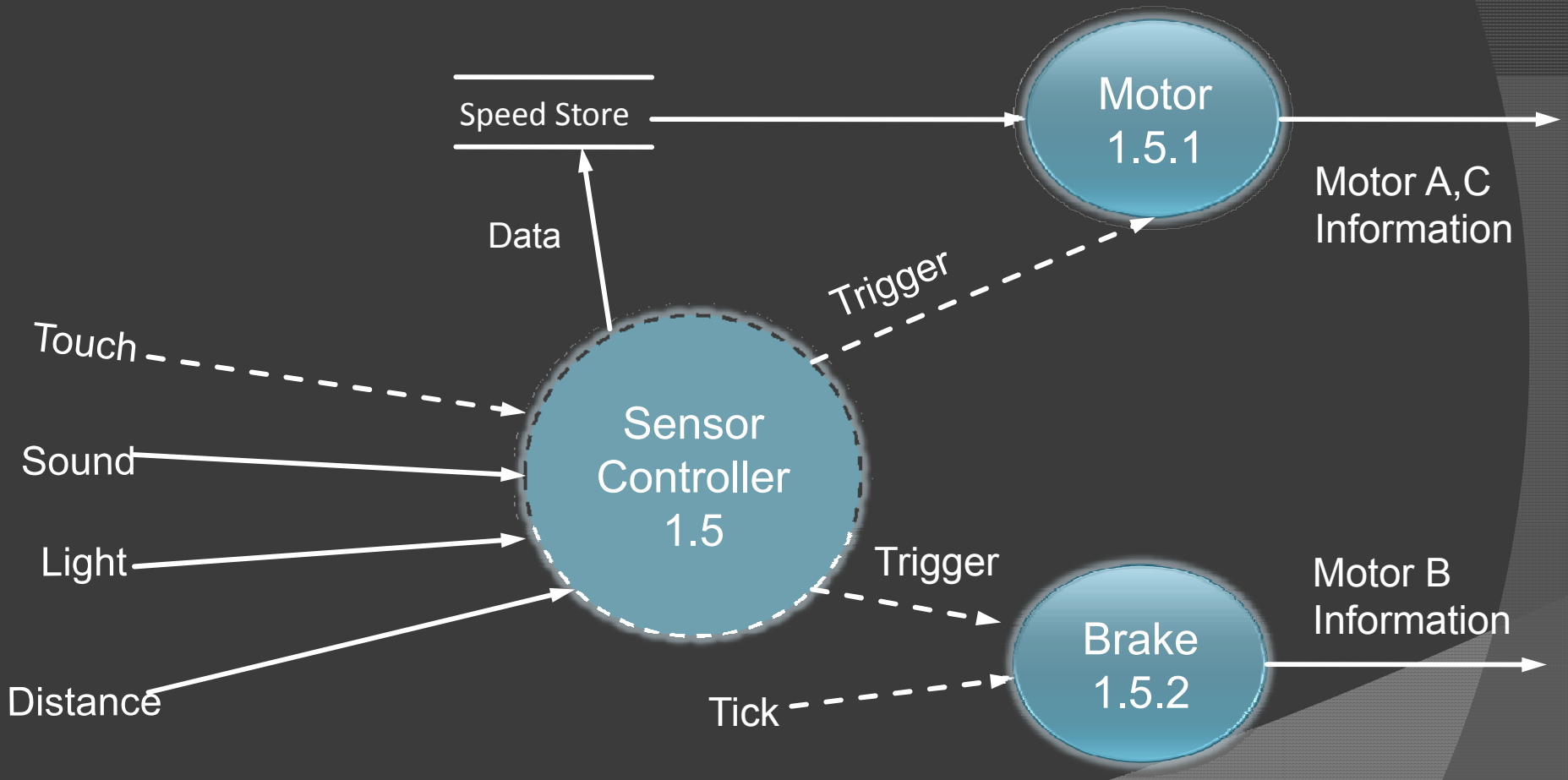
DFD Level 0--Information

Output Event	Description	Format
Motor	Move and Control direction	2 tracks, 1 brake
Display	Show the states of the Robot	Working, Sleeping
Speak	Speak the saved sentence	Thank You, Good Morning/Night

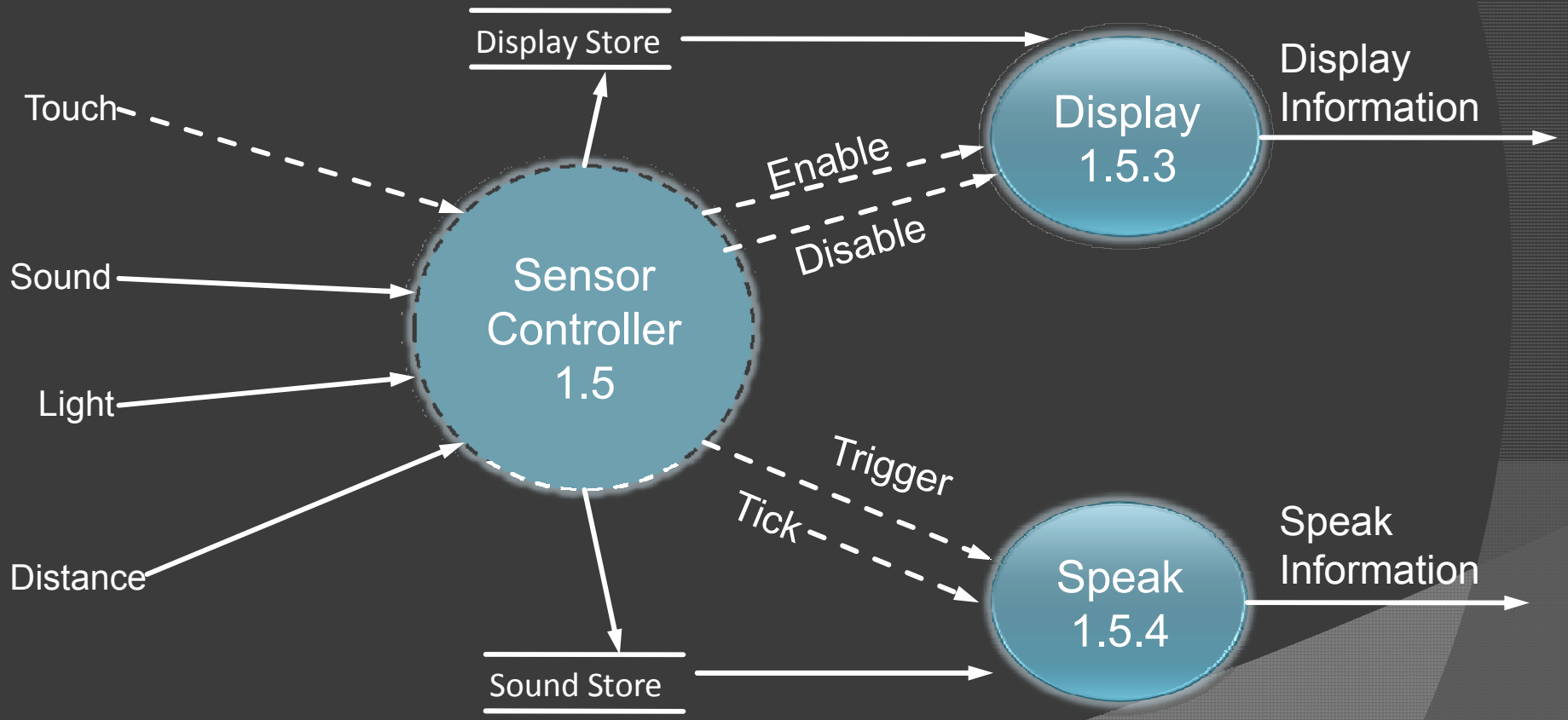
Structured Analysis
DFD Level 1



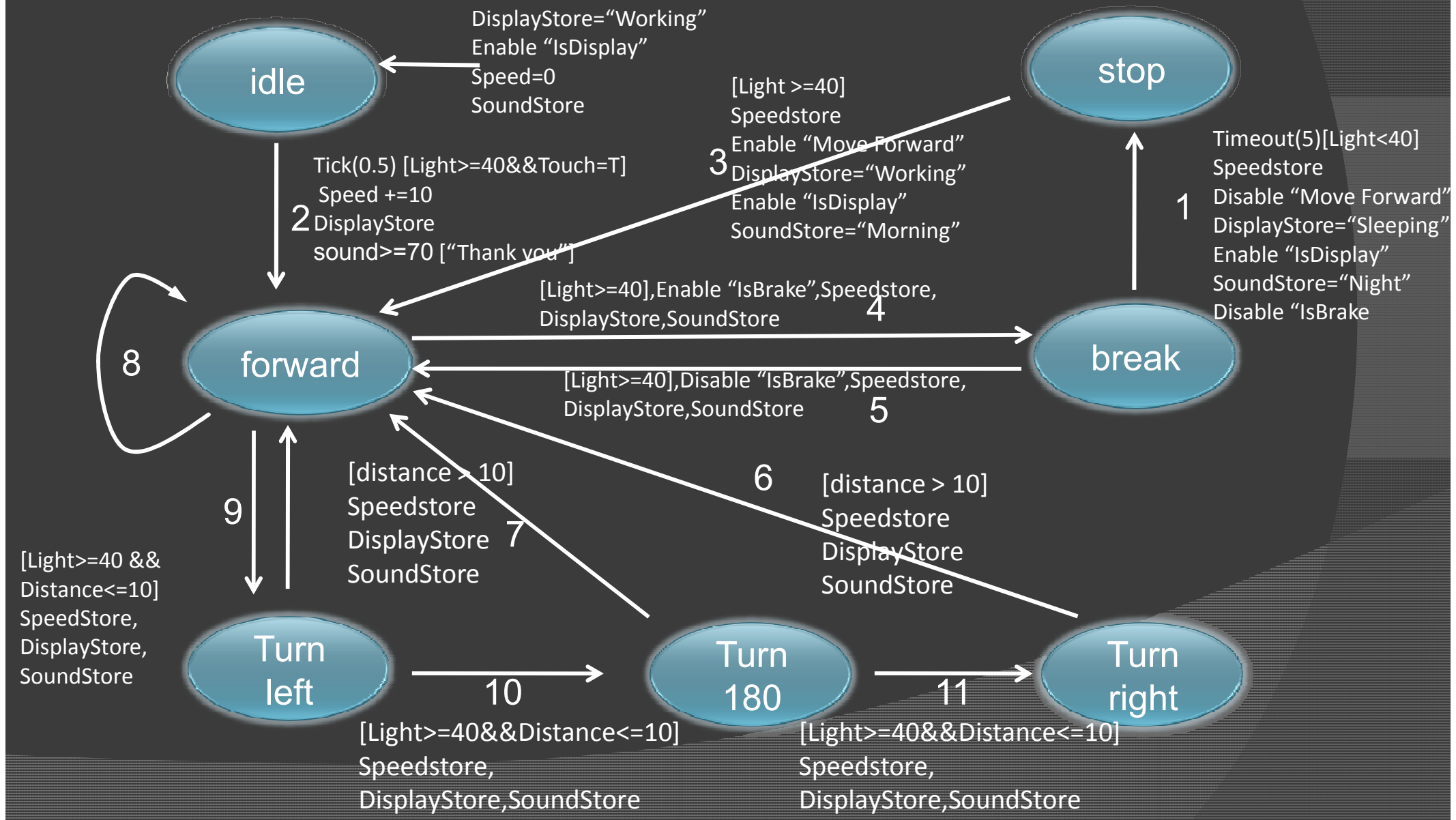
Structured Analysis
DFD Level 2



Structured Analysis
DFD Level 2



Structured Analysis State Machine



Structured Analysis
State Machine Description

State No.	Description
1	Timeout(5)[Light<40] Speedstore Disable “Move Forward”, DisplayStore=“Sleeping” Enable “IsDisplay”, SoundStore=“Night”, Disable “IsBrake
2	Tick(0.5) [Light>=40&&Touch=T] Speed +=10, DisplayStore, sound>=70 [“Thank you”]
3	[Light >=40] Speedstore, Enable “Move Forward”, DisplayStore=“Working”, Enable “IsDisplay”, SoundStore=“Morning”
4	[Light>=40],Enable “IsBrake”,Speedstore, DisplayStore,SoundStore
5	[Light>=40],Disable “IsBrake”,Speedstore, DisplayStore,SoundStore
6	[distance > 10], Speedstore, DisplayStore, SoundStore

Structured Analysis
State Machine Description

State No.	Description
7	[distance > 10], Speedstore, DisplayStore, SoundStore
8	TouchCount=odd Speed -=10, DisplayStore =“Working”,SoundStore= “Thank you” TouchCount=odd Speed +=10, DisplayStore= “Working”,SoundStore =“Thank you” [Light>=40&&Distance>10&&Sound>=70] Speed, DisplayStore =“Working”, SoundStore= “Thank you”
9	[Light>=40 && Distance<=10], SpeedStore, DisplayStore, SoundStore
10	[Light>=40&&Distance<=10], Speedstore, DisplayStore,SoundStore
11	[Light>=40&&Distance<=10], Speedstore, DisplayStore,SoundStore

Structured Analysis

Process Specification

PSpec 1.1	Touch Interface
Stereotype	Asynchronous Function
Input	Touch Input
Output	(bool)Touch
Description	Get Touch Input through touch sensor
PSpec 1.2	**Sound Interface**
Stereotype	Periodic Function
Input	Sound Input, tick
Output	(int) Sound
Description	Recognize sound patterns and identify tone differences through Sound Sensor

Structured Analysis

Process Specification

PSpec 1.3	Light Interface
Stereotype	Periodic Function
Input	Light Input, Tick
Output	(int) Light
Description	Enables robot to distinguish between light and dark
PSpec 1.4	**Ultrasonic Interface**
Stereotype	Periodic Function
Input	Distance Input, Tick
Output	(int) Distance
Description	Judge distances and "see" where objects are

Structured Analysis

Process Specification

PSpec 1.5	Controller
Stereotype	Control
Input	(bool)Touch, (int)Sound, (int)Bright, (int) Distance, Structure Data
Output	Motor Data, Speed Data, Trigger
Description	The core component in design structure which converts input stimulation to output reaction

Structured Analysis

Process Specification

PSpec 1.5.1	Motor
Stereotype	Synchronous Function
Input	Motor Data(bool, int)
Output	Motor Information(int, bool, int)
Description	Get input data from controller and make related movement

PSpec 1.5.2	Brake
Stereotype	Synchronous Function
Input	Trigger, Tick
Output	Motor Information(int, bool, int)
Description	Brake whenever get an interrupt of time or objects

Structured Analysis

Process Specification

PSpec 1.5.3	Display
Stereotype	Synchronous Function
Input	Enable / Disable
Output	Display Information(string)
Description	Control the display through controller

PSpec 1.5.4	Speak
Stereotype	Synchronous Function
Input	Trigger, Tick
Output	Speak Information(string)
Description	Control the speak through controller

Structured Analysis

Process Specification

PSpec 1.6	Motor Interface
Stereotype	Synchronous Function
Input	Motor Information(int, bool, int)
Output	Motor
Description	Control the movement by input data
PSpec 1.7	**Display Interface**
Stereotype	Asynchronous Function
Input	Display Information(string)
Output	Display
Description	Control the display by controller
PSpec 1.8	**Speaker Interface**
Stereotype	Synchronous Function
Input	Speak Information(string)
Output	Speak
Description	Control the speaker by controller

Structured Analysis

Data Dictionary

Data name	Definition
Touch	Get Touch Input through touch sensor
Sound	Recognize sound patterns and identify tone differences through Sound Sensor
Light	Enables robot to distinguish between light and dark
Distance	Judge distances and "see" where objects are
Data	Data sent to structure data from controller
Motor A,C data	Get input data from controller and make related movement

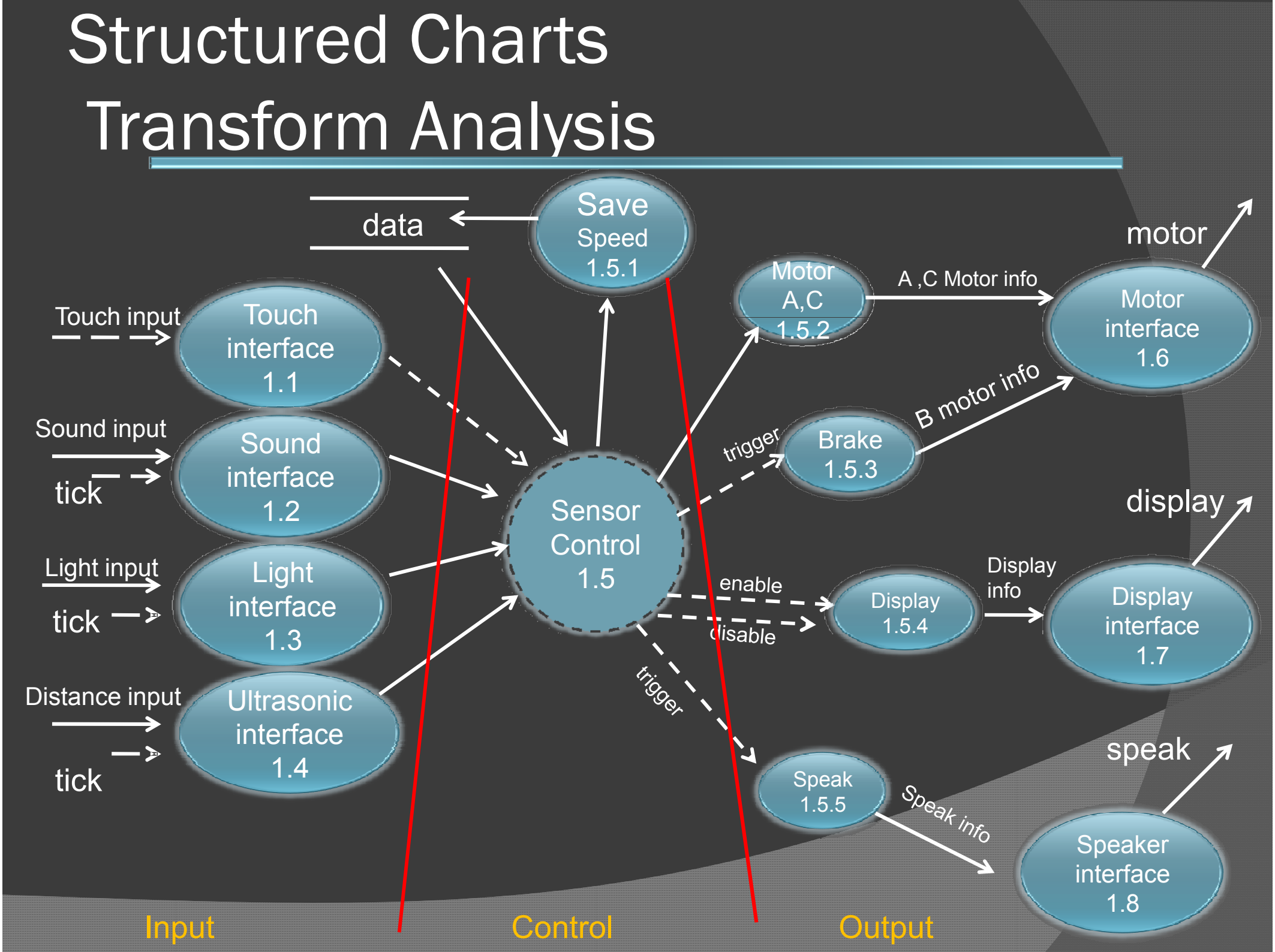
Structured Analysis

Data Dictionary

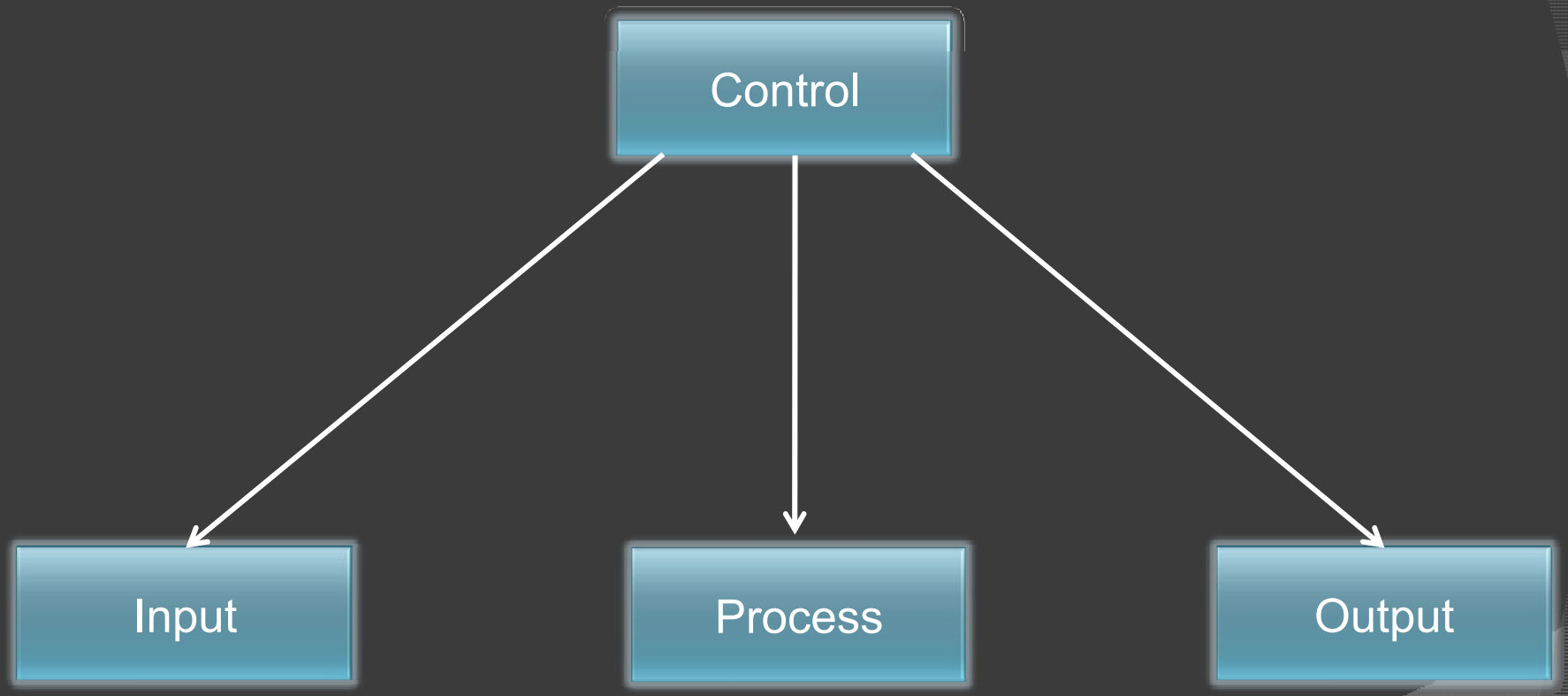
Data name	Definition
Motor B data	Brake whenever get an interrupt of time or objects
Speed/Display/Sound Store	Store the data for apply for next step
Motor A,C information	Control the movement by input data
Display Information	Control the display by controller
Speak Information	Control the speaker by controller

Structured Design

Structured Charts
Transform Analysis



Structured Charts Transform Analysis

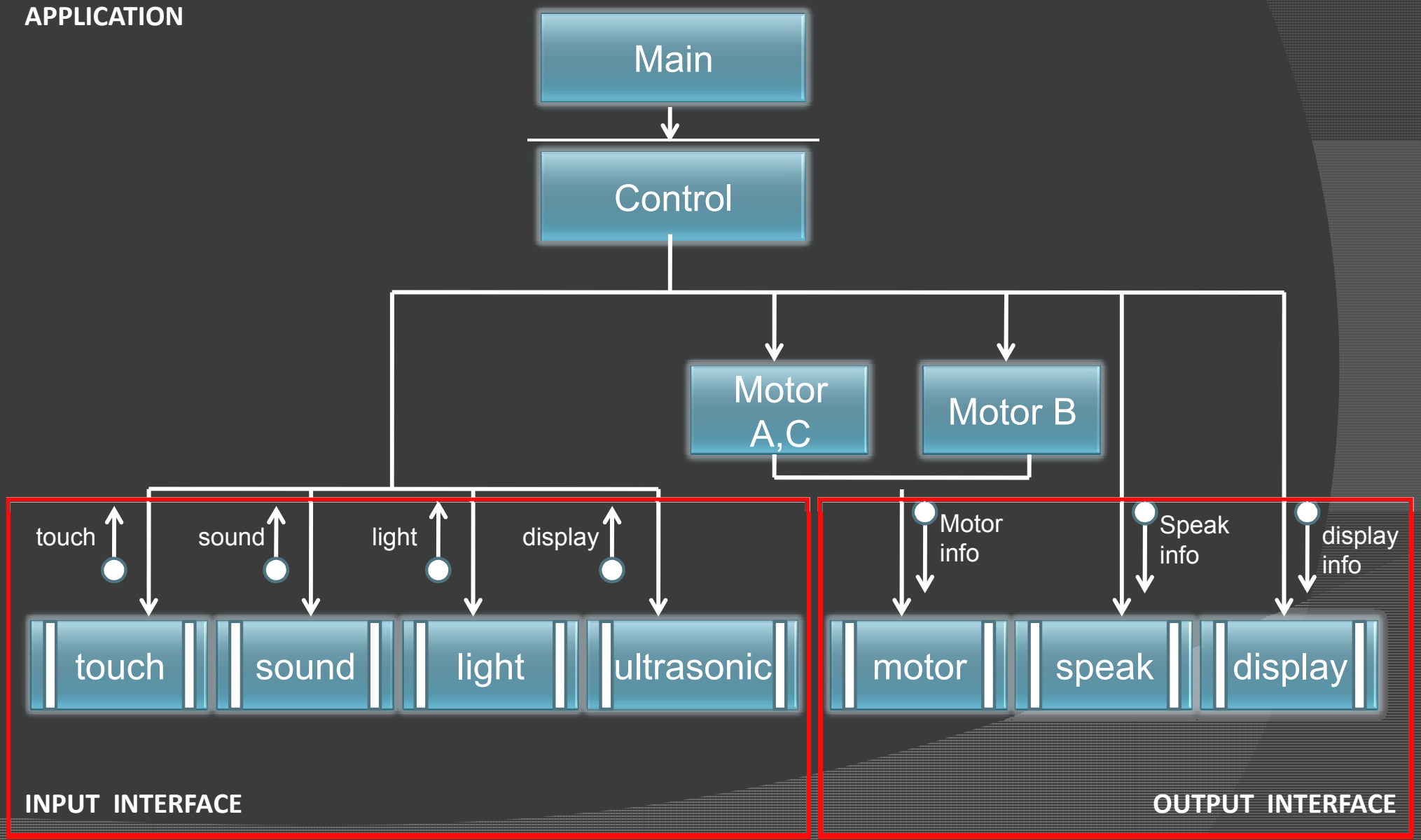


- Touch
- sound
- Light
- distance

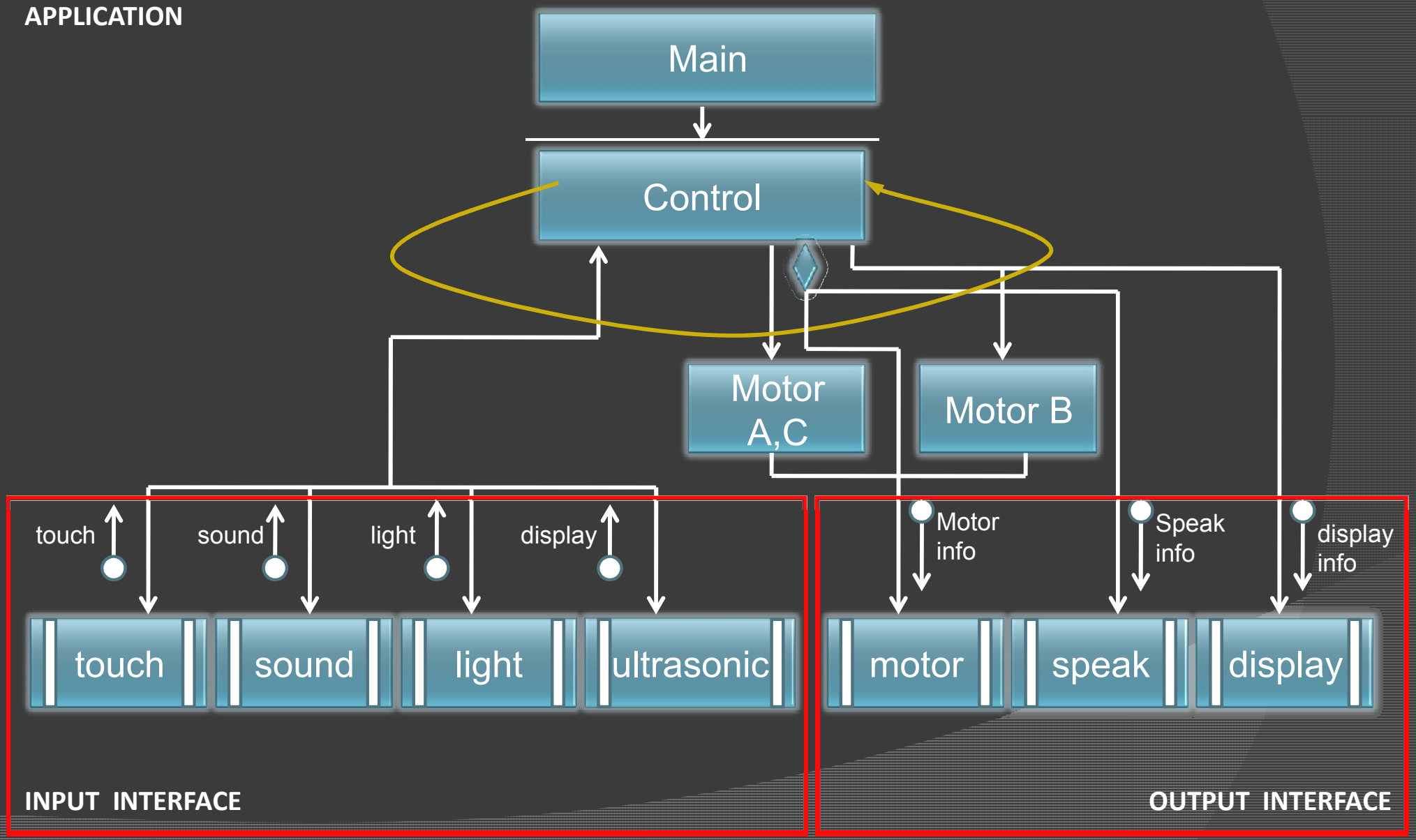
- Save data
- Brake
-Display
- Speak

- Motor information
- Speak information
- Display information

Structured Charts(Basic)



Structured Charts(Advanced)



Module Definition

Module Name	Main
Function	Control the controller
Interface	
Module Name	**Control**
Function	Process data flow, send control flow
Interface	Start_controller()
Module Name	**Touch**
Function	capture touch input from Touch Sensor
Interface	Get_touch()

Module Definition

Module Name	**Sound**
Function	capture sound input from Sound Sensor
Interface	Get_sound()
Module Name	**Light**
Function	capture light input from Light Sensor
Interface	Get_Light()
Module Name	**Ultrasonic**
Function	capture distance input from ultrasonic Sensor
Interface	Get_distance()
Module Name	**Motor A, Motor C**
Function	Control movement and direction
Interface	Set_motor_A(int bool, int speed) Set_motor_C(int bool, int speed)

Module Definition

Module Name	**Motor B**
Function	Start/Stop, brake on/off
Interface	Set_motor_B(int bool, int speed)
Module Name	**Speaker**
Function	Speak on/off depends on sound and light input
Interface	set_speaker(string sp_info)
Module Name	**Display**
Function	Display sentences respectively depends on different situations
Interface	Set_display(string dis_info)

Data Definition

Data Name	Definition	Type
Touch	Output a variable depends on touch sensor input	bool
Sound	Output a variable depends on sound sensor input	Int (0~100)
Light	Output a variable depends on sound sensor input	Int (0~100)
Distance	Output a variable depends on sound sensor input	Int (0~255)
Motor Data	Control direction, state(move/stop/ brake)	Structure (bool direction, int speed)
Motor Information	Send data to motor interface	Structure(int choose, bool direction, int speed)
Speak Information	Send data to speak interface	String
Display Information	Send data to display interface	String

Thank you!

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