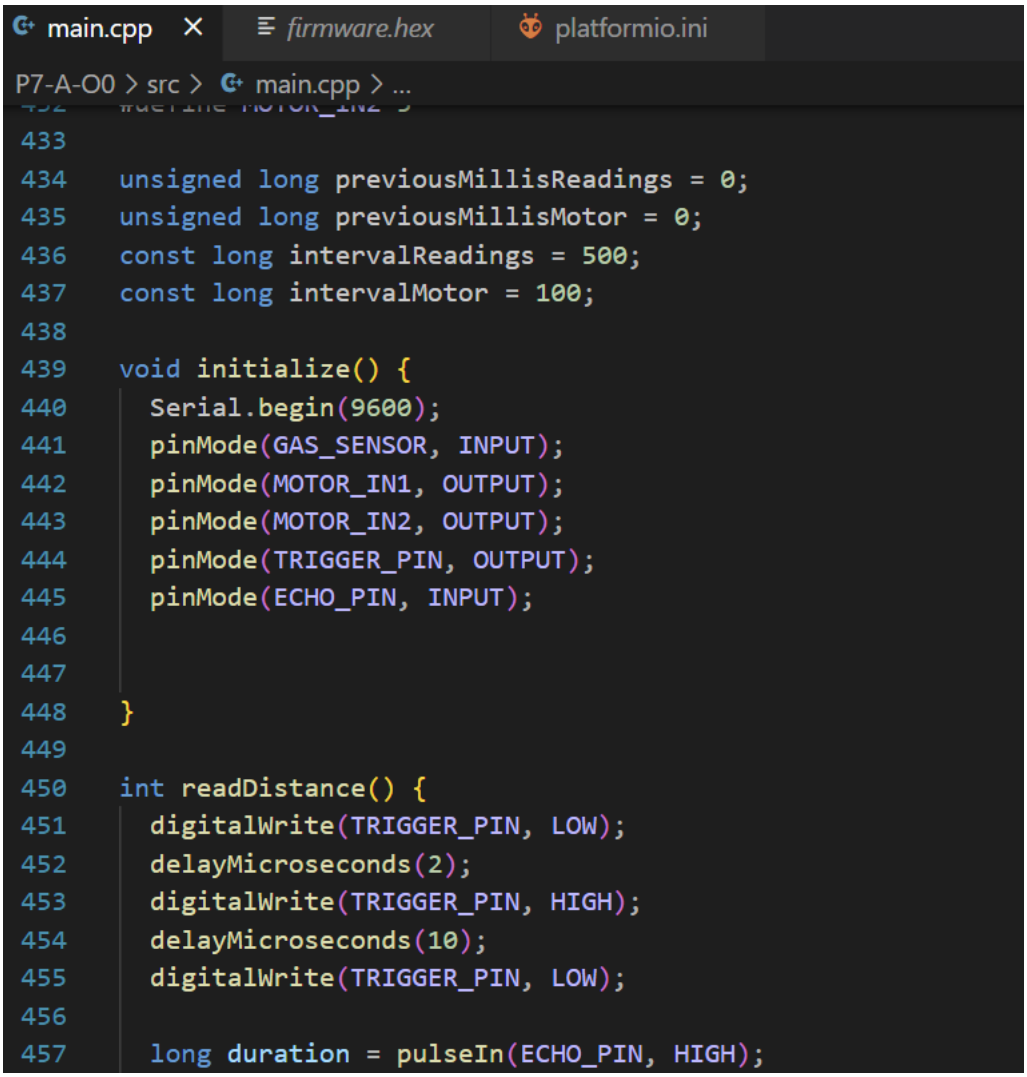
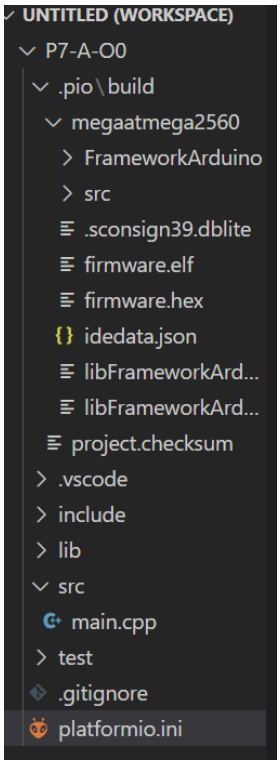
گزارش سوال 2 تمرین سری 7

سوال 2)

الف)

ابتدا با توجه به خواسته سوال یک پروژه در platform io با بورد Arduino mega 2560 میسازیم و در بخش main.cpp کد کنترل کننده خود را قرار میدهیم :





حال در قسمت کد جنریت شده یک setup میسازیم که در آن برنامه را 100 بار در یک لوپ ران گرفته و مجموع تایم و میانگین را بدست میاوریم :

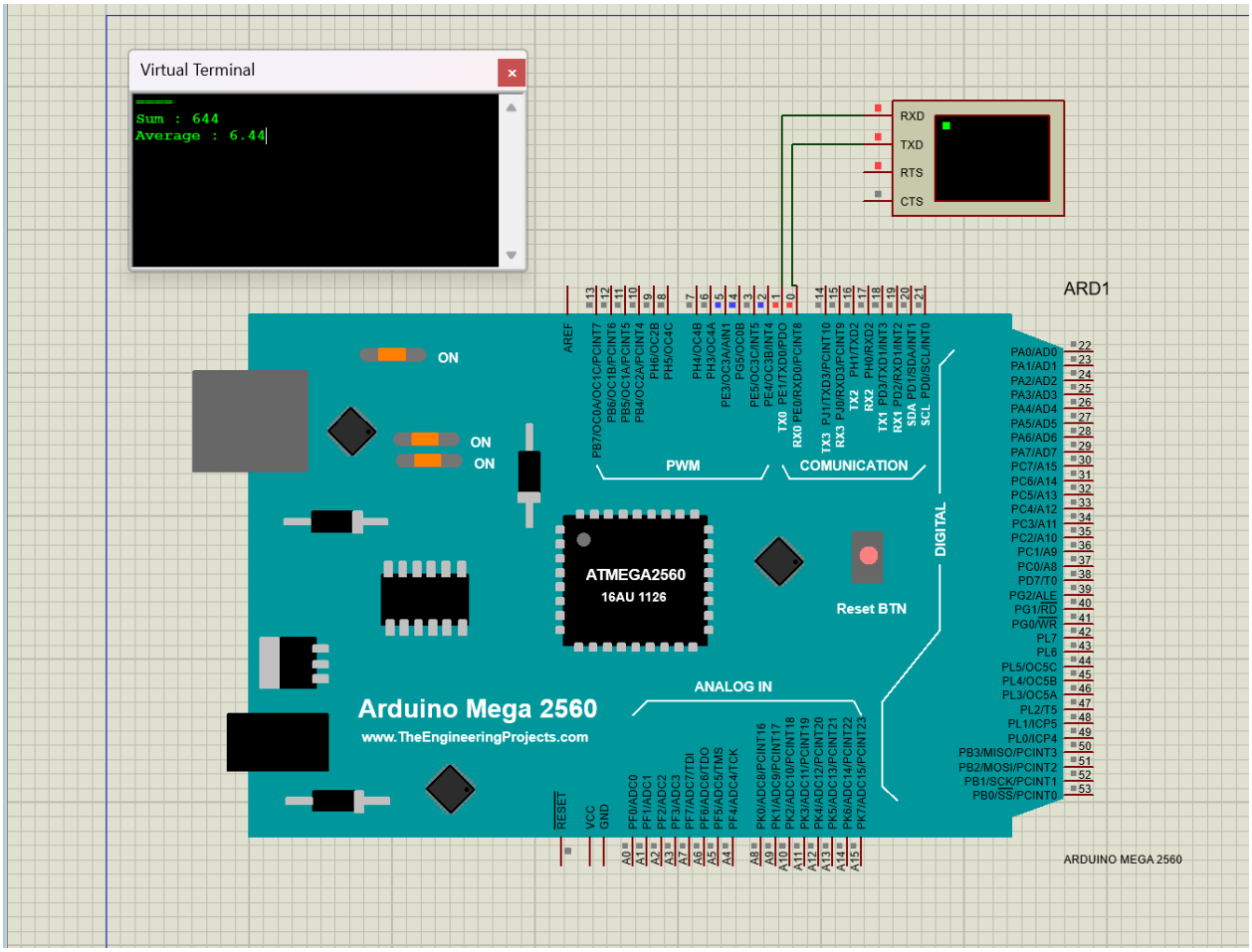
```
void setup() {
  // put your setup code here, to run once:
  initialize();

  float sum = 0;
  int count = 100;

  for (int i = 1; i <= count; ++i)
  {
    unsigned long start = micros();
    step();
    unsigned long end = micros();
    unsigned long delta = end - start;
    sum += delta;
  }
  double avg = sum / count;
  Serial.println("====");
  Serial.print("Sum : ");
  Serial.println(int(sum));
  Serial.print("Average : ");
  Serial.print((avg));
}
```

حال در فایل platformio.ini میاییم و برای کدمان هربار سطح کامپایلر را انتخاب میکنیم :

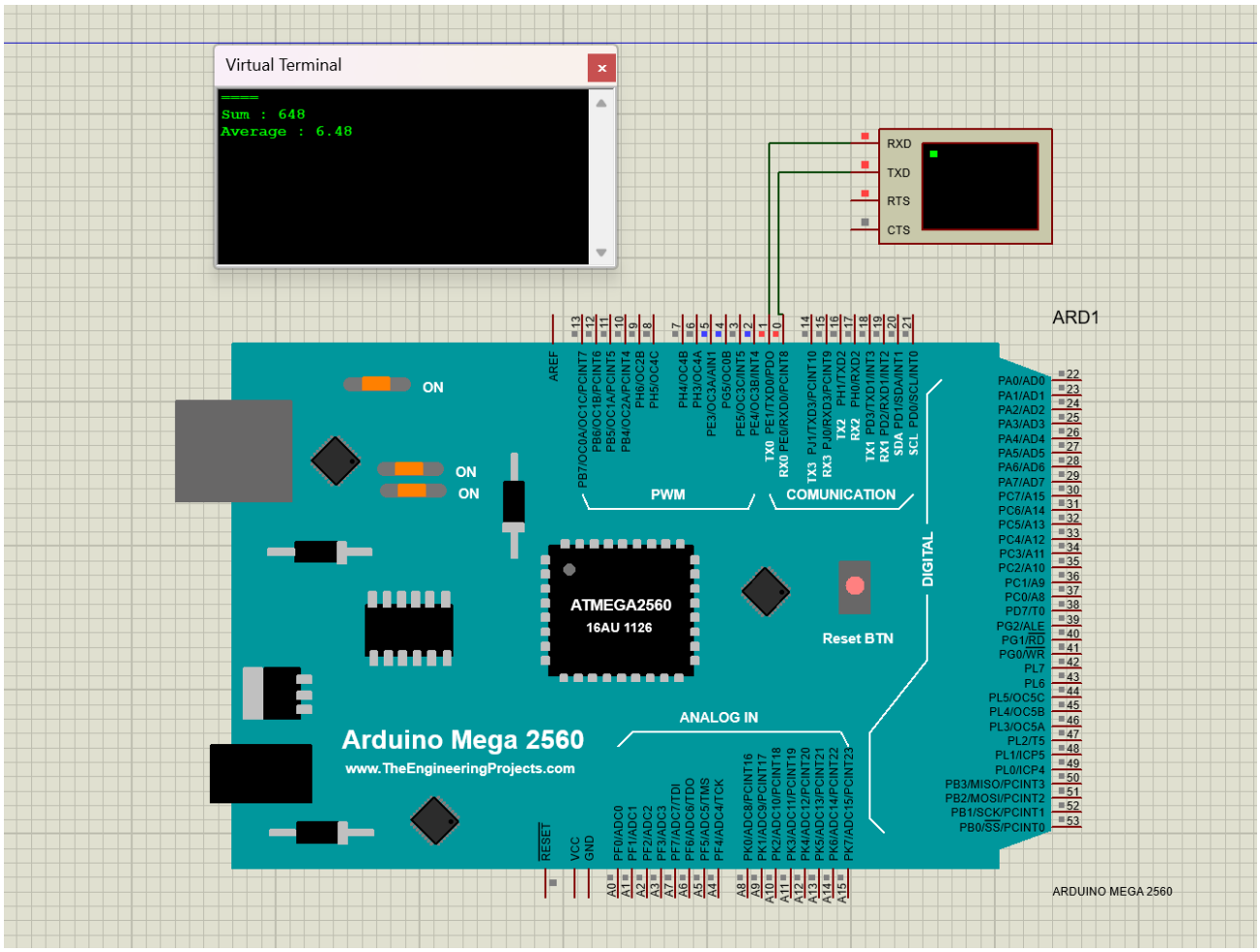
```
[env:megaatmega2560]
platform = atmelavr
board = megaatmega2560
framework = arduino
build_flags = -O0
build_unflags = -Os
```

در ادامه بیلد گرفته و فایل hex. را در proteus به یک بورد Arduino با یک خروجی دیجیتال وصل میکنیم.

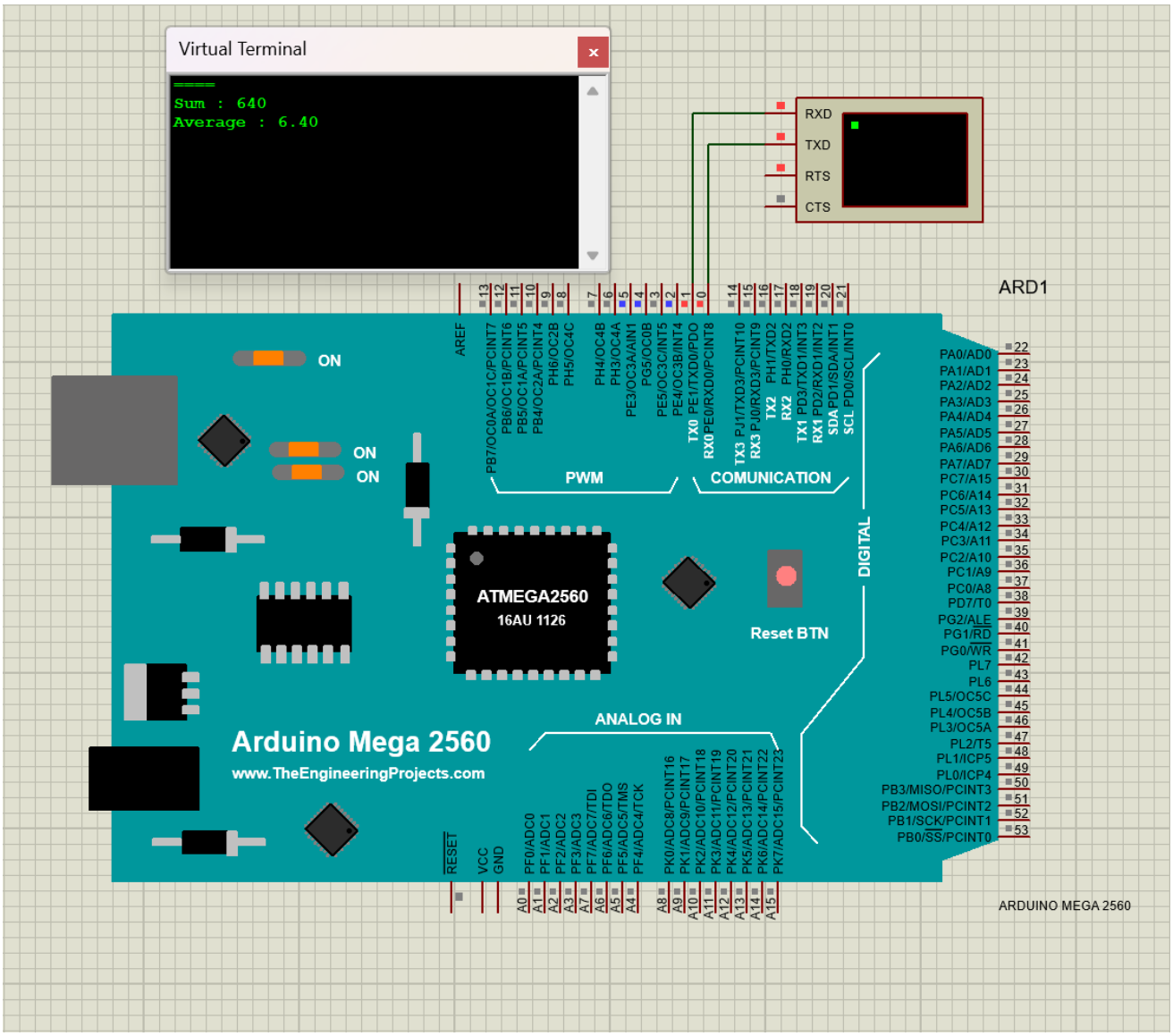
خروجی O0- :


Virtual Terminal
Sum : 644
Average : 6.44
RXD
TXD
RTS
CTS
ARD1
ON
ON
ON
ATMEGA2560
16AU 1126
Reset BTN
Arduino Mega 2560
www.TheEngineeringProjects.com
PWM
COMUNICATION
DIGITAL
ANALOG IN
ARDUINO MEGA 2560

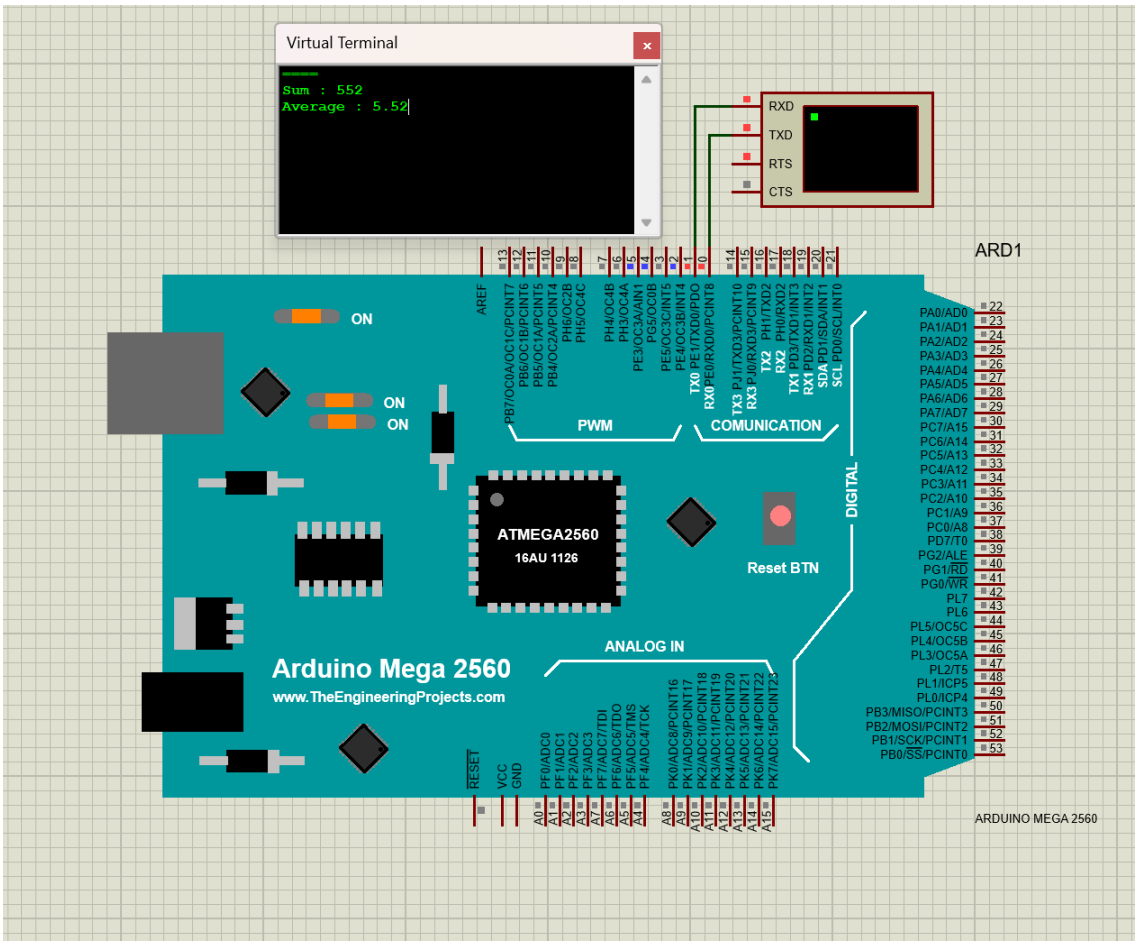
خروجی O1- :


Virtual Terminal
Sum : 648
Average : 6.48
RXD
TXD
RTS
CTS
ARD1
ON
ON
ON
PWM
COMUNICATION
DIGITAL
ATMEGA2560
16AU 1126
Reset BTN
ANALOG IN
Arduino Mega 2560
www.TheEngineeringProjects.com
ARDUINO MEGA 2560

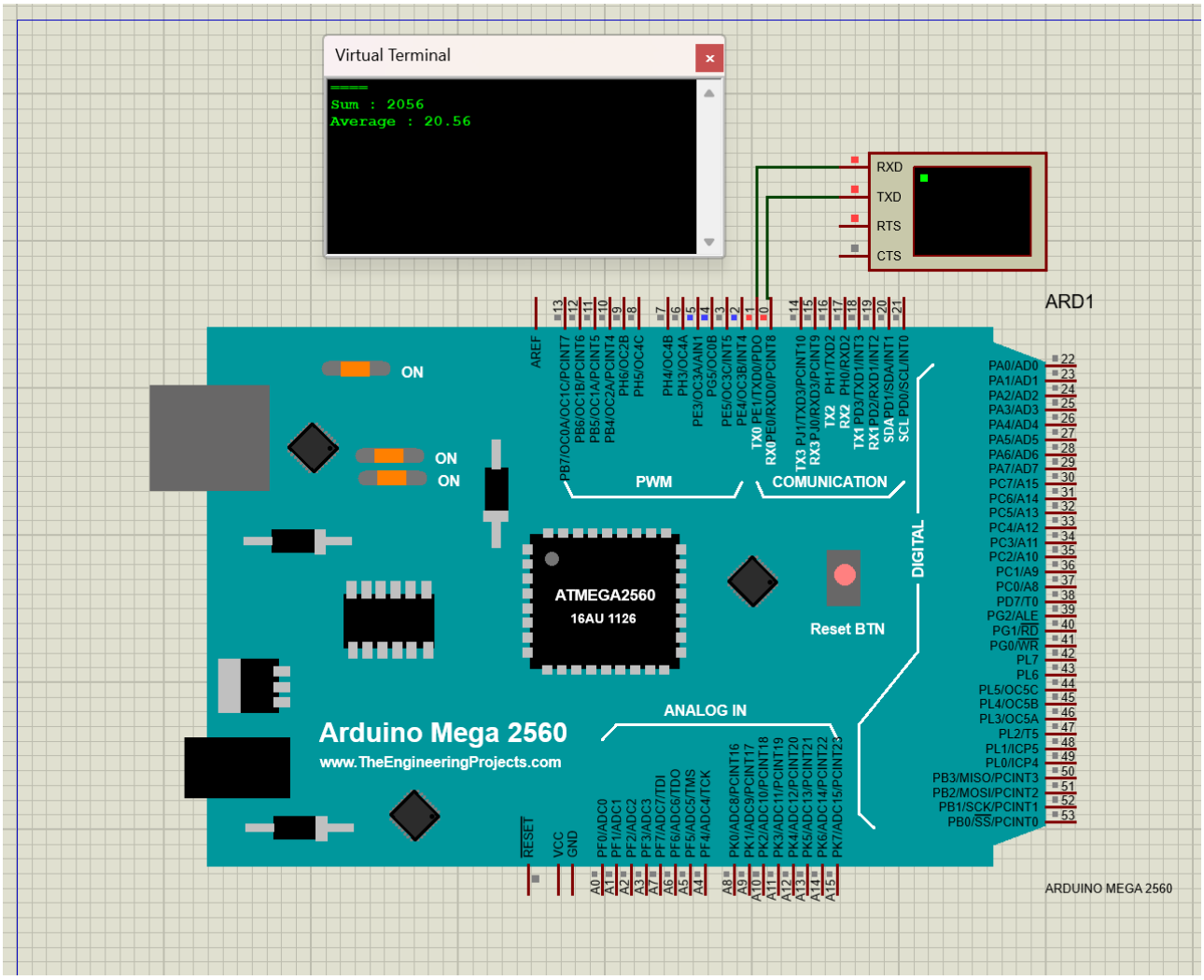
خروجی O2- :


Virtual Terminal
Sum : 640
Average : 6.40
RXD
TXD
RTS
CTS
ARD1
ON
ON
ON
ATMEGA2560
16AU 1126
Reset BTN
PWM
COMUNICATION
DIGITAL
ANALOG IN
Arduino Mega 2560
www.TheEngineeringProjects.com
ARDUINO MEGA 2560

خروجی O3- :


Virtual Terminal
Sum : 552
Average : 5.52
RXD
TXD
RTS
CTS
ARD1
ON
ON
ON
PWM
COMUNICATION
DIGITAL
ATMEGA2560
16AU 1126
Reset BTN
ANALOG IN
Arduino Mega 2560
www.TheEngineeringProjects.com
ARDUINO MEGA 2560

خروجی O3- :


Virtual Terminal
Sum : 2056
Average : 20.56
RXD
TXD
RTS
CTS
ARD1
ON
ON
ON
PWM
COMUNICATION
DIGITAL
ATMEGA2560
16AU 1126
Reset BTN
ANALOG IN
Arduino Mega 2560
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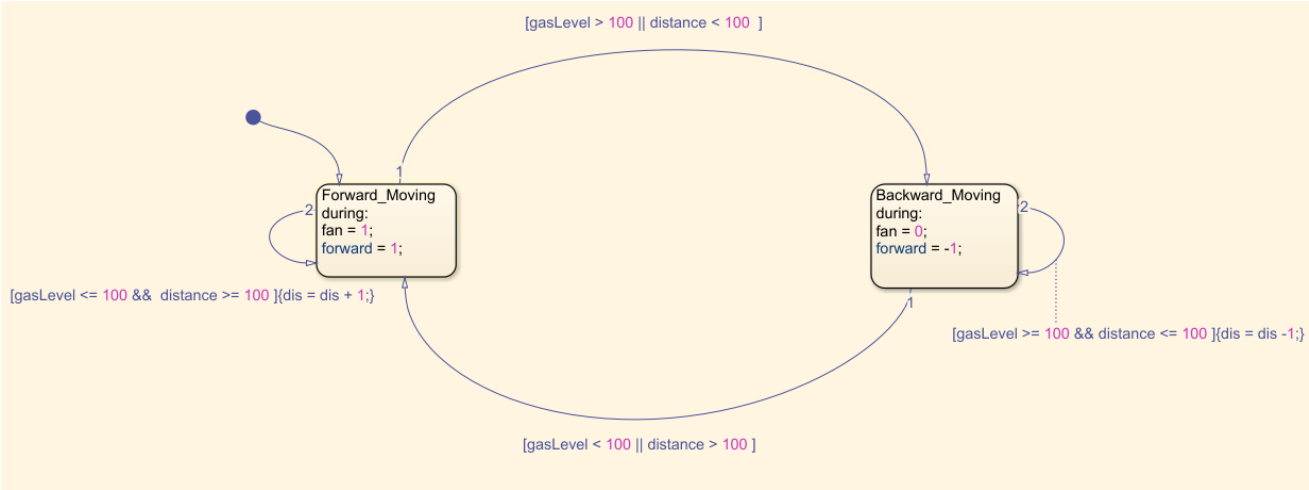
ARDUINO MEGA 2560

ب)

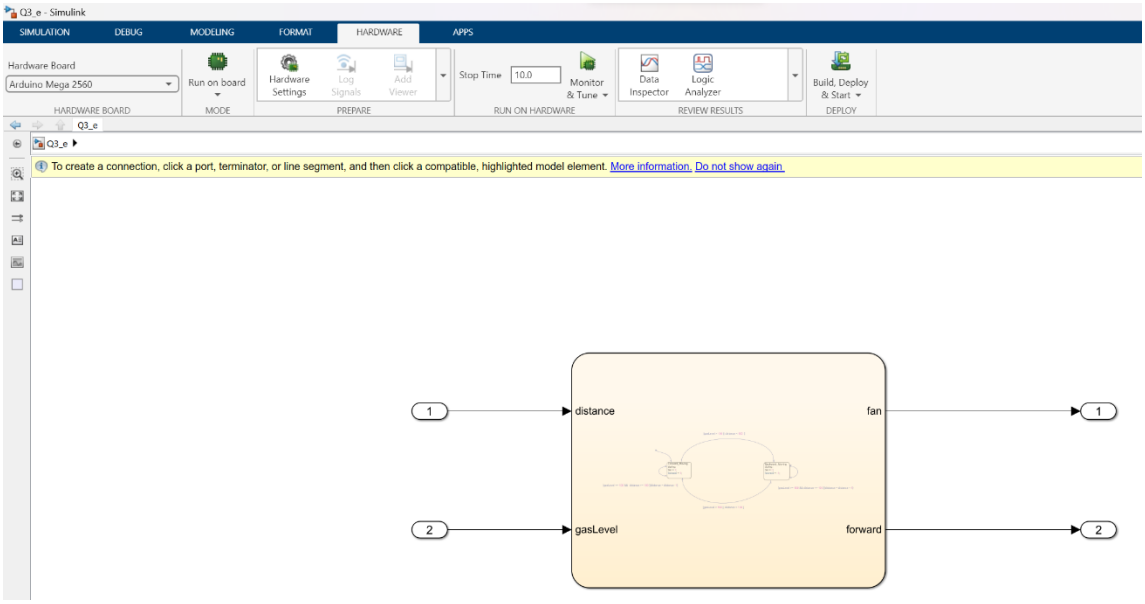
حال میاییم stateflow ای که در تمرین 5 زده بودیم را بهینه سازی کرده و به صورت زیر

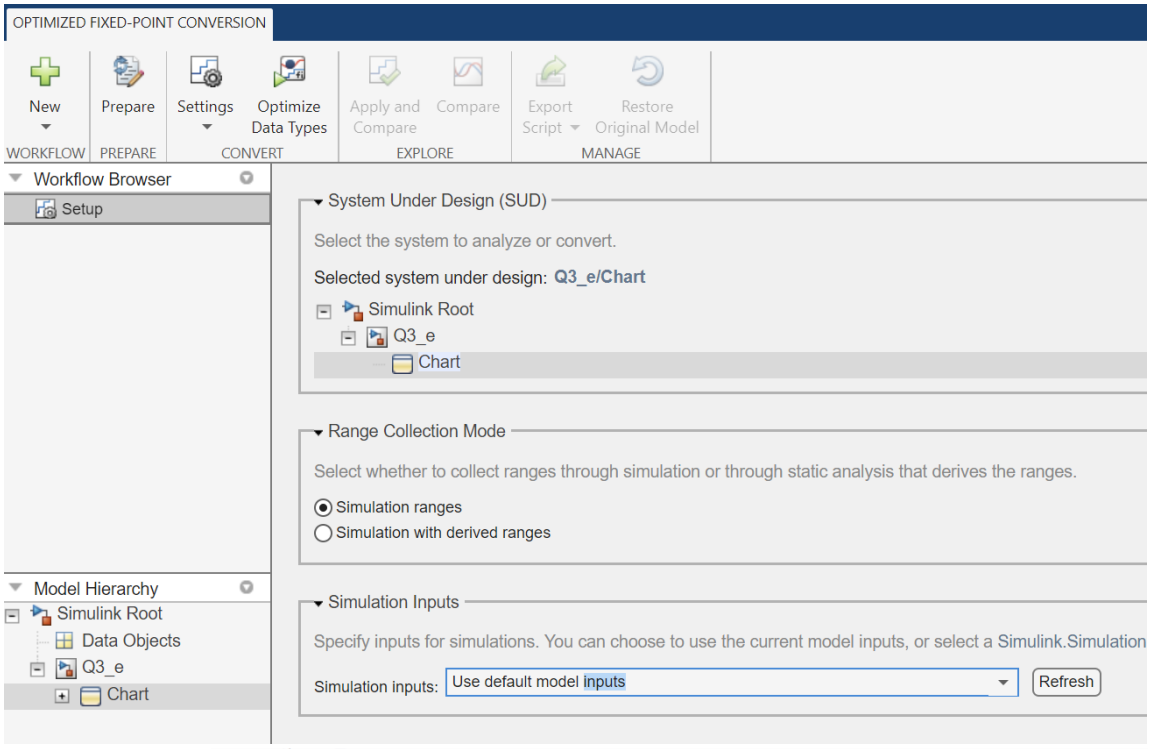
پیاده سازی میکنیم :

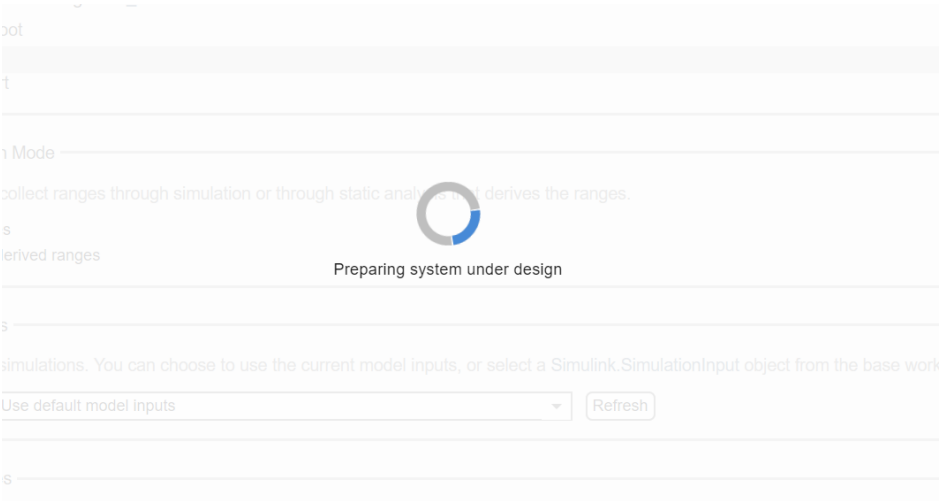


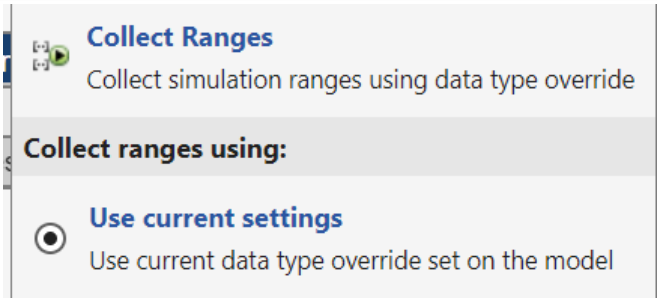
در ادامه از ابزار fixed-point designer برای تبدیل ممیز شناور به ممیز ثابت استفاده میکنیم

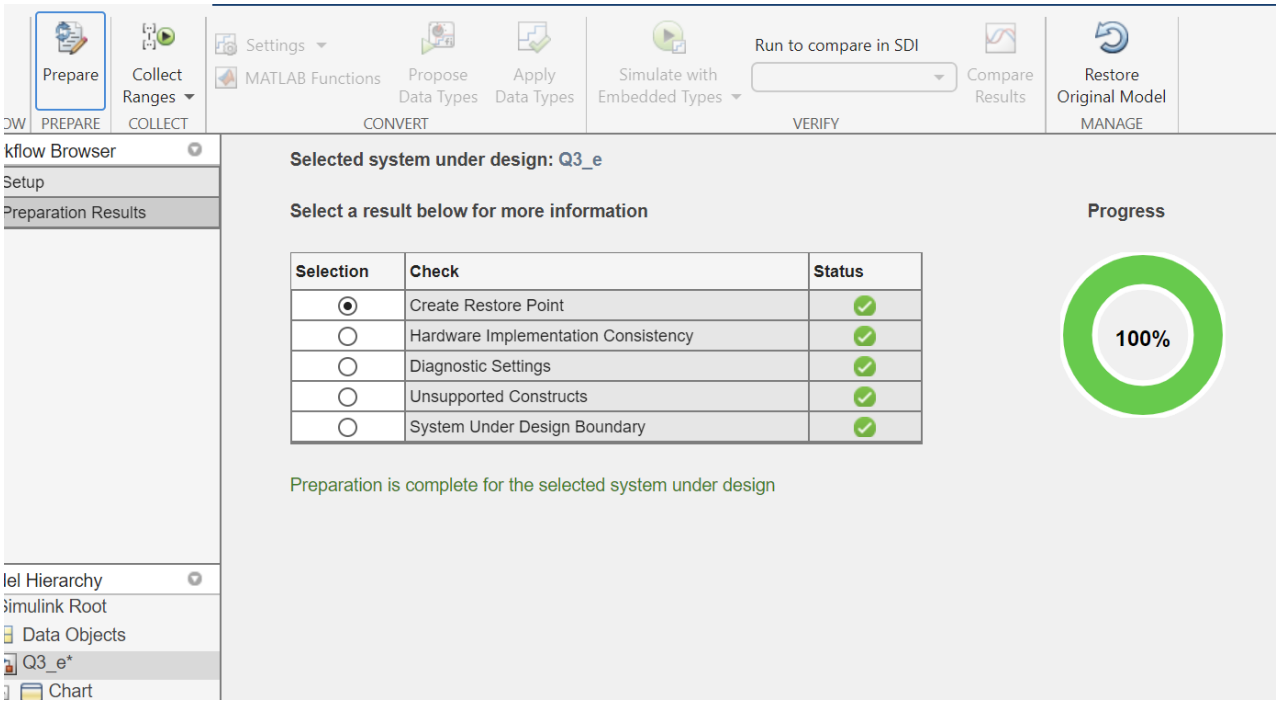
و مراحل به صورت زیر است:

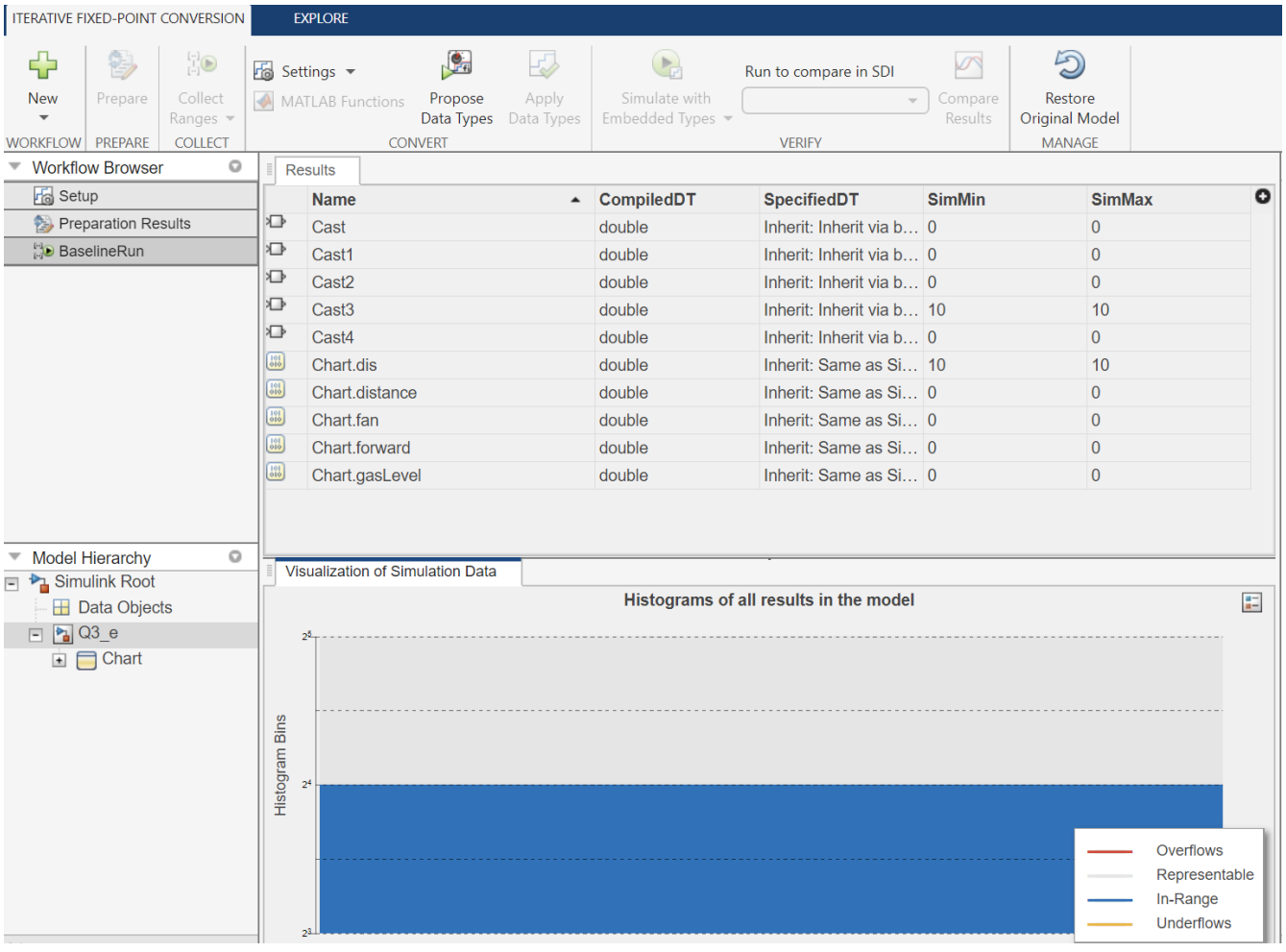


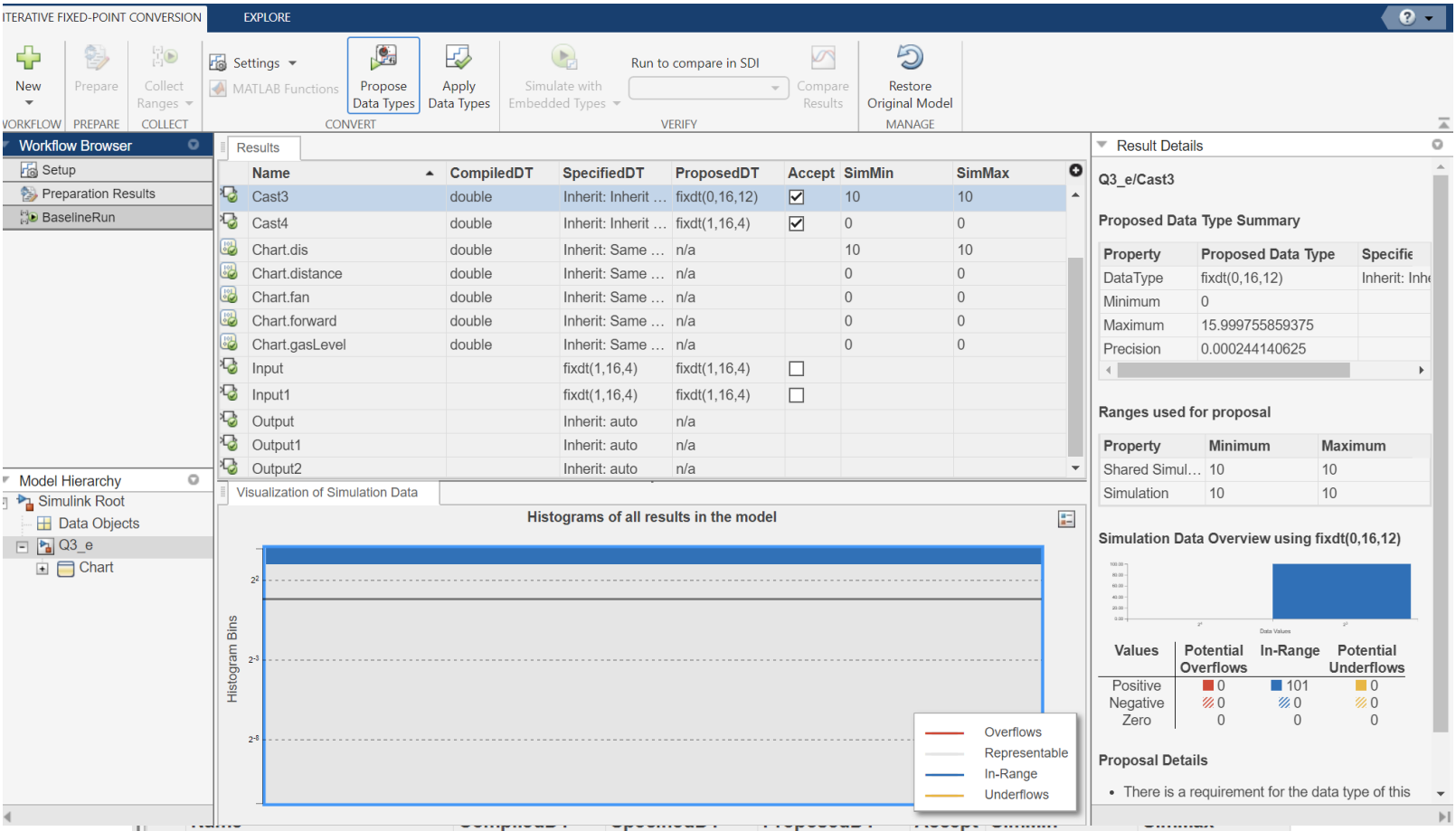

OPTIMIZED FIXED-POINT CONVERSION
New
Prepare
Settings
Optimize Data Types
Apply and Compare
Compare
Export Script
Restore Original Model
WORKFLOW
PREPARE
CONVERT
EXPLORE
MANAGE
Workflow Browser
Setup
Model Hierarchy
Simulink Root
Data Objects
Q3_e
Chart
System Under Design (SUD)
Select the system to analyze or convert.
Selected system under design: Q3_e/Chart
Simulink Root
Q3_e
Chart
Range Collection Mode
Select whether to collect ranges through simulation or through static analysis that derives the ranges.
Simulation ranges
Simulation with derived ranges
Simulation Inputs
Specify inputs for simulations. You can choose to use the current model inputs, or select a Simulink.Simulation
Simulation inputs:
Use default model inputs
Refresh


Preparing system under design

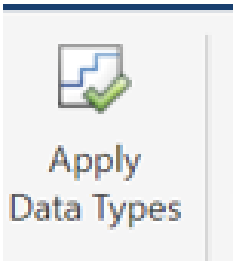

Collect Ranges
Collect simulation ranges using data type override
Collect ranges using:
Use current settings
Use current data type override set on the model

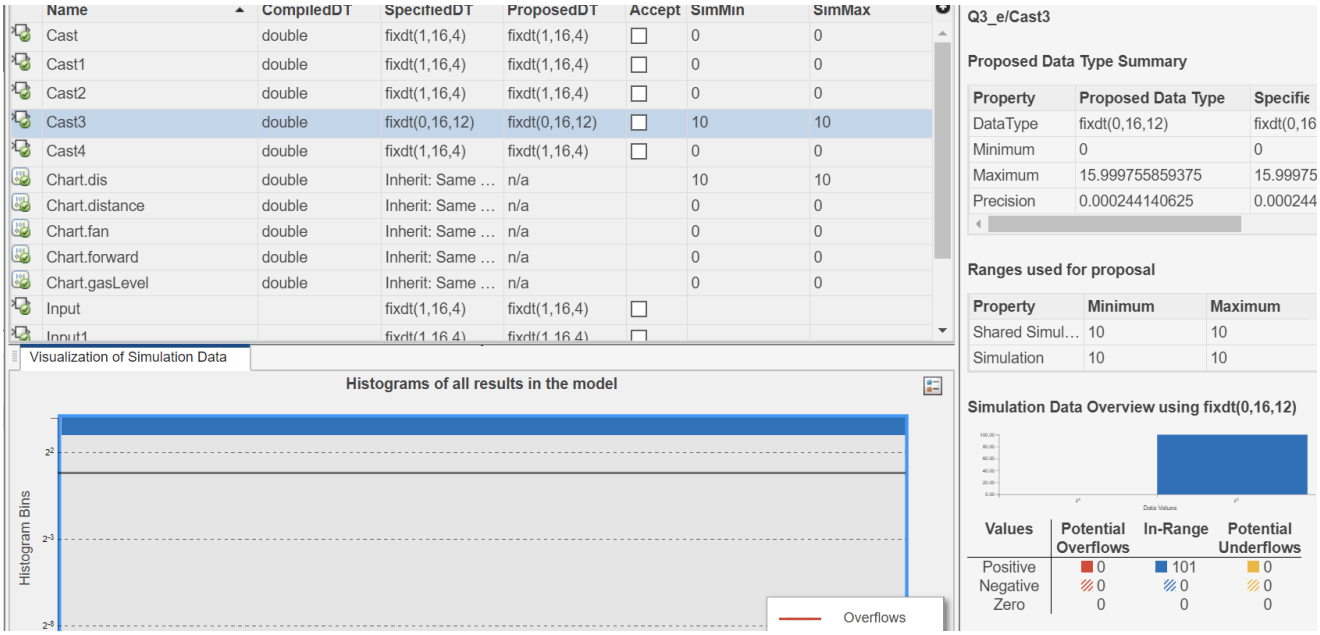

Prepare
Collect Ranges
PREPARE
COLLECT
Settings
MATLAB Functions
Propose Data Types
Apply Data Types
CONVERT
Simulate with Embedded Types
Run to compare in SDI
Compare Results
VERIFY
Restore Original Model
MANAGE
kflow Browser
Setup
Preparation Results
lel Hierarchy
imulink Root
Data Objects
Q3_e*
Chart
Selected system under design: Q3_e
Select a result below for more information
Progress
Selection
Check
Status
Create Restore Point
Hardware Implementation Consistency
Diagnostic Settings
Unsupported Constructs
System Under Design Boundary
100%
Preparation is complete for the selected system under design

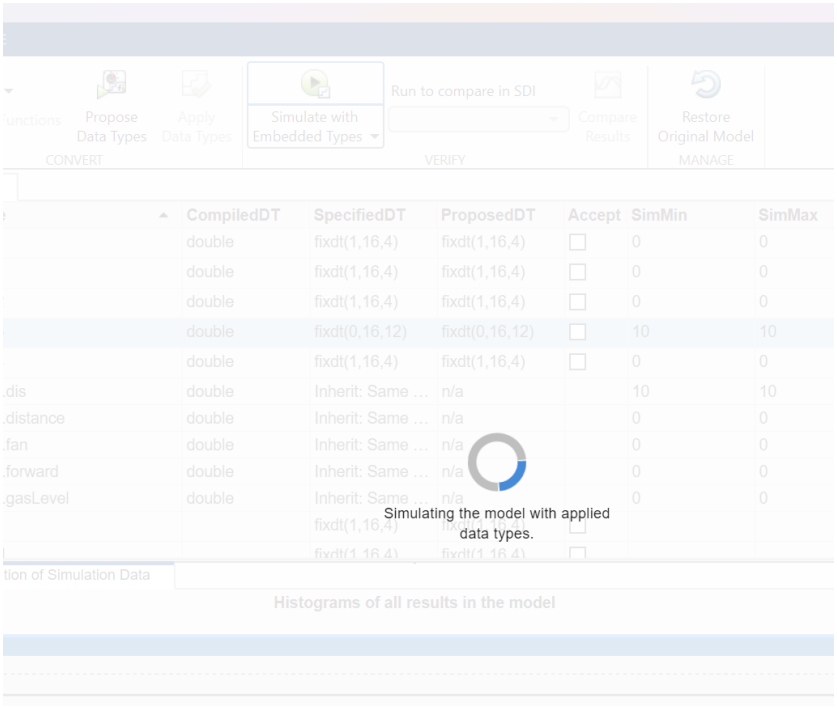

ITERATIVE FIXED-POINT CONVERSION
EXPLORE
New
WORKFLOW
Prepare
Collect Ranges
PREPARE
COLLECT
Settings
MATLAB Functions
Propose Data Types
Apply Data Types
CONVERT
Simulate with Embedded Types
Run to compare in SDI
Compare Results
VERIFY
Restore Original Model
MANAGE
Workflow Browser
Setup
Preparation Results
BaselineRun
Results
Name
CompiledDT
SpecifiedDT
SimMin
SimMax
Cast double Inherit: Inherit via b… 0 0
Cast1 double Inherit: Inherit via b… 0 0
Cast2 double Inherit: Inherit via b… 0 0
Cast3 double Inherit: Inherit via b… 10 10
Cast4 double Inherit: Inherit via b… 0 0
Chart.dis double Inherit: Same as Si… 10 10
Chart.distance double Inherit: Same as Si… 0 0
Chart.fan double Inherit: Same as Si… 0 0
Chart.forward double Inherit: Same as Si… 0 0
Chart.gasLevel double Inherit: Same as Si… 0 0
Model Hierarchy
Simulink Root
Data Objects
Q3_e
Chart
Visualization of Simulation Data
Histograms of all results in the model
Histogram Bins
Overflows
Representable
In-Range
Underflows

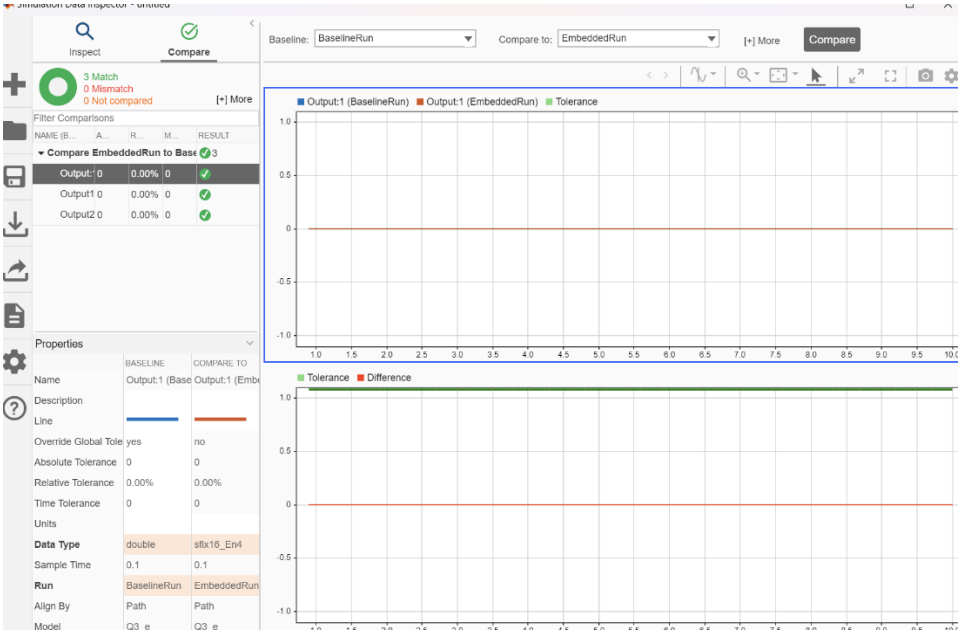


Cast	double	Inherit: Inherit …	fixdt(1,16,4)	☑	0	0
Cast1	double	Inherit: Inherit …	fixdt(1,16,4)	☑	0	0
Cast2	double	Inherit: Inherit …	fixdt(1,16,4)	☑	0	0
Cast3	double	Inherit: Inherit …	fixdt(0,16,12)	☑	10	10
Cast4	double	Inherit: Inherit …	fixdt(1,16,4)	☑	0	0
Chart.dis	double	Inherit: Same …	n/a		10	10




Name
CompiledDT
SpecifiedDT
ProposedDT
Accept
SimMin
SimMax
Cast double fixdt(1,16,4) fixdt(1,16,4) 0 0
Cast1 double fixdt(1,16,4) fixdt(1,16,4) 0 0
Cast2 double fixdt(1,16,4) fixdt(1,16,4) 0 0
Cast3 double fixdt(0,16,12) fixdt(0,16,12) 10 10
Cast4 double fixdt(1,16,4) fixdt(1,16,4) 0 0
Chart.dis double Inherit: Same … n/a 10 10
Chart.distance double Inherit: Same … n/a 0 0
Chart.fan double Inherit: Same … n/a 0 0
Chart.forward double Inherit: Same … n/a 0 0
Chart.gasLevel double Inherit: Same … n/a 0 0
Input fixdt(1,16,4) fixdt(1,16,4)
Visualization of Simulation Data
Histograms of all results in the model
Histogram Bins
Overflows
Q3_e/Cast3
Proposed Data Type Summary
Property
Proposed Data Type
DataType fixdt(0,16,12)
Minimum 0
Maximum 15.999755859375
Precision 0.000244140625
Ranges used for proposal
Property
Minimum
Maximum
Shared Simul… 10 10
Simulation 10 10
Simulation Data Overview using fixdt(0,16,12)
Values
Potential Overflows
In-Range
Potential Underflows
Positive 0 101 0
Negative 0 0 0
Zero 0 0 0


Propose Data Types
Apply Data Types
Simulate with Embedded Types
Run to compare in SDI
Compare Results
Restore Original Model
CONVERT
VERIFY
MANAGE
Simulating the model with applied data types.
Histograms of all results in the model

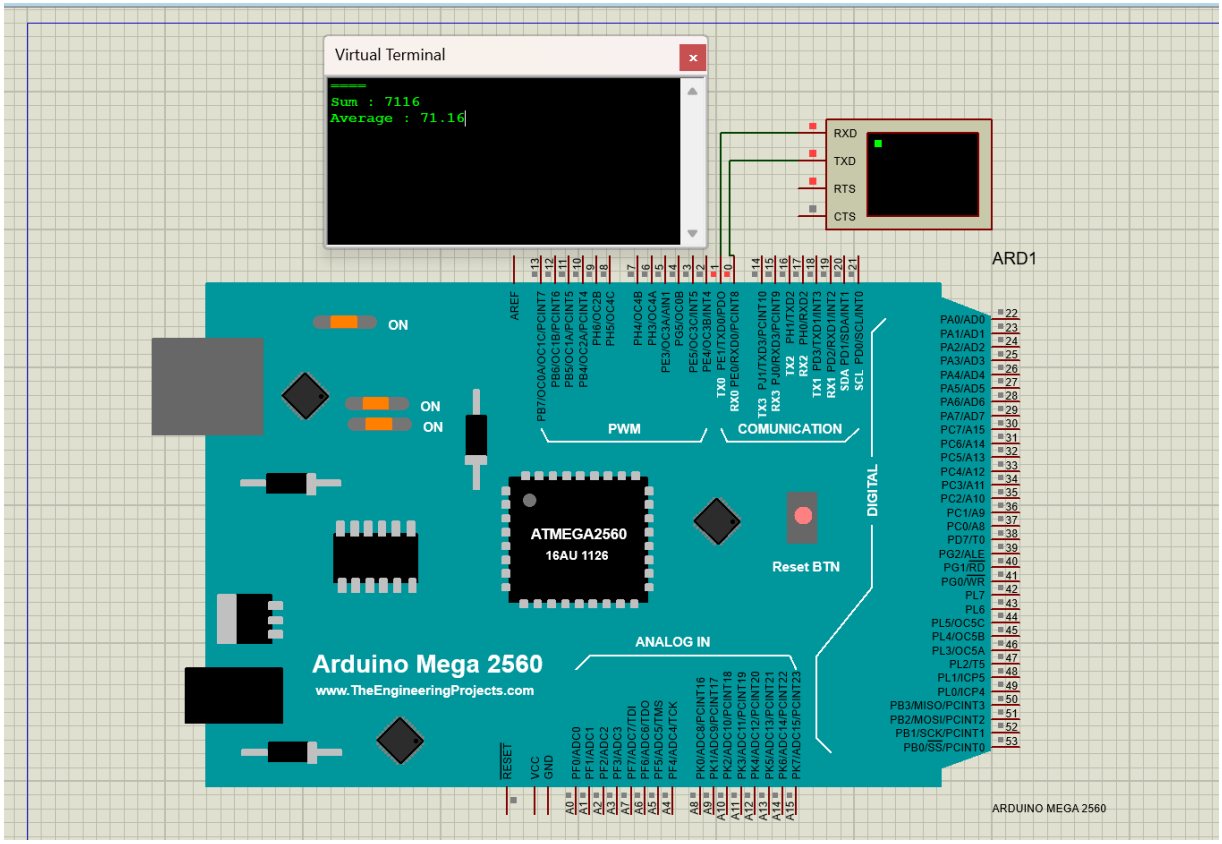


حال تبدیل انجام شد.

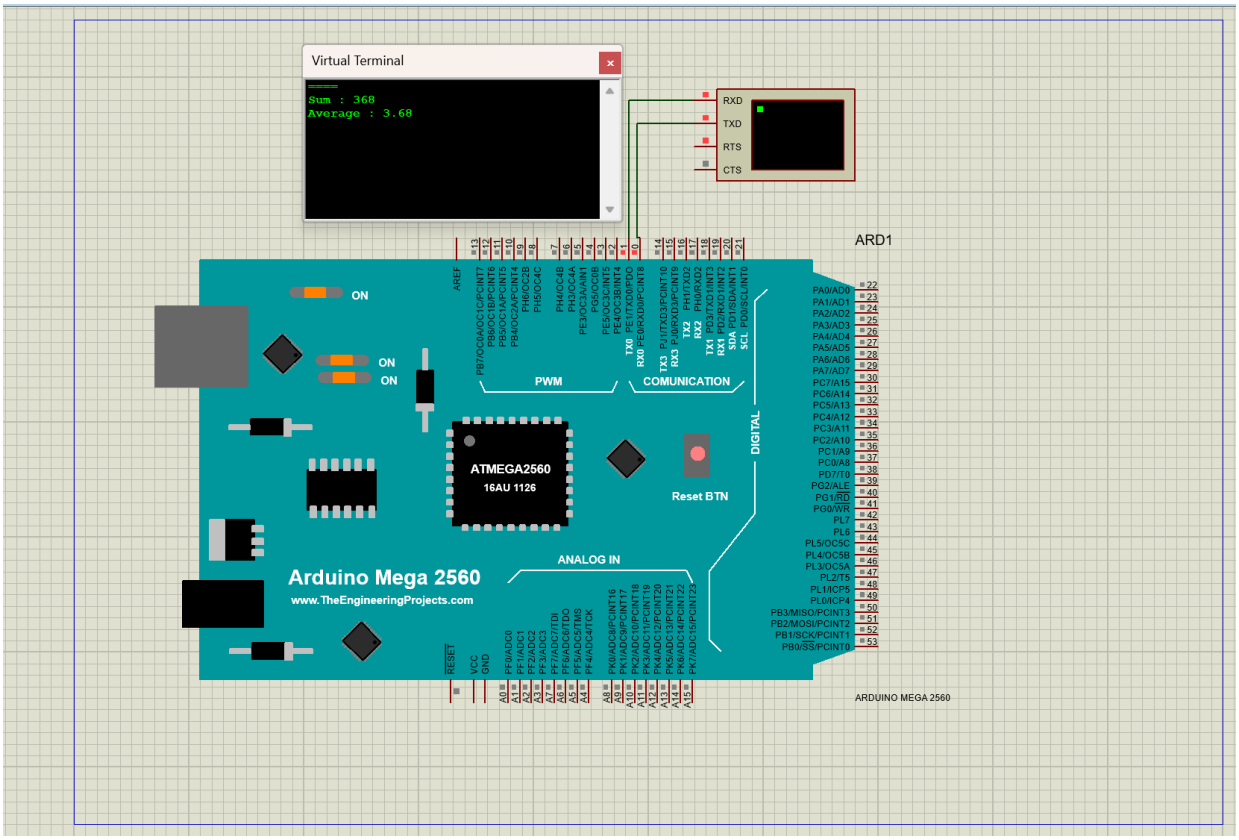
ج)

مانند مرحله الف کد جدید جنریت شده را برای هر کامپایلر کامپایل میکنیم :

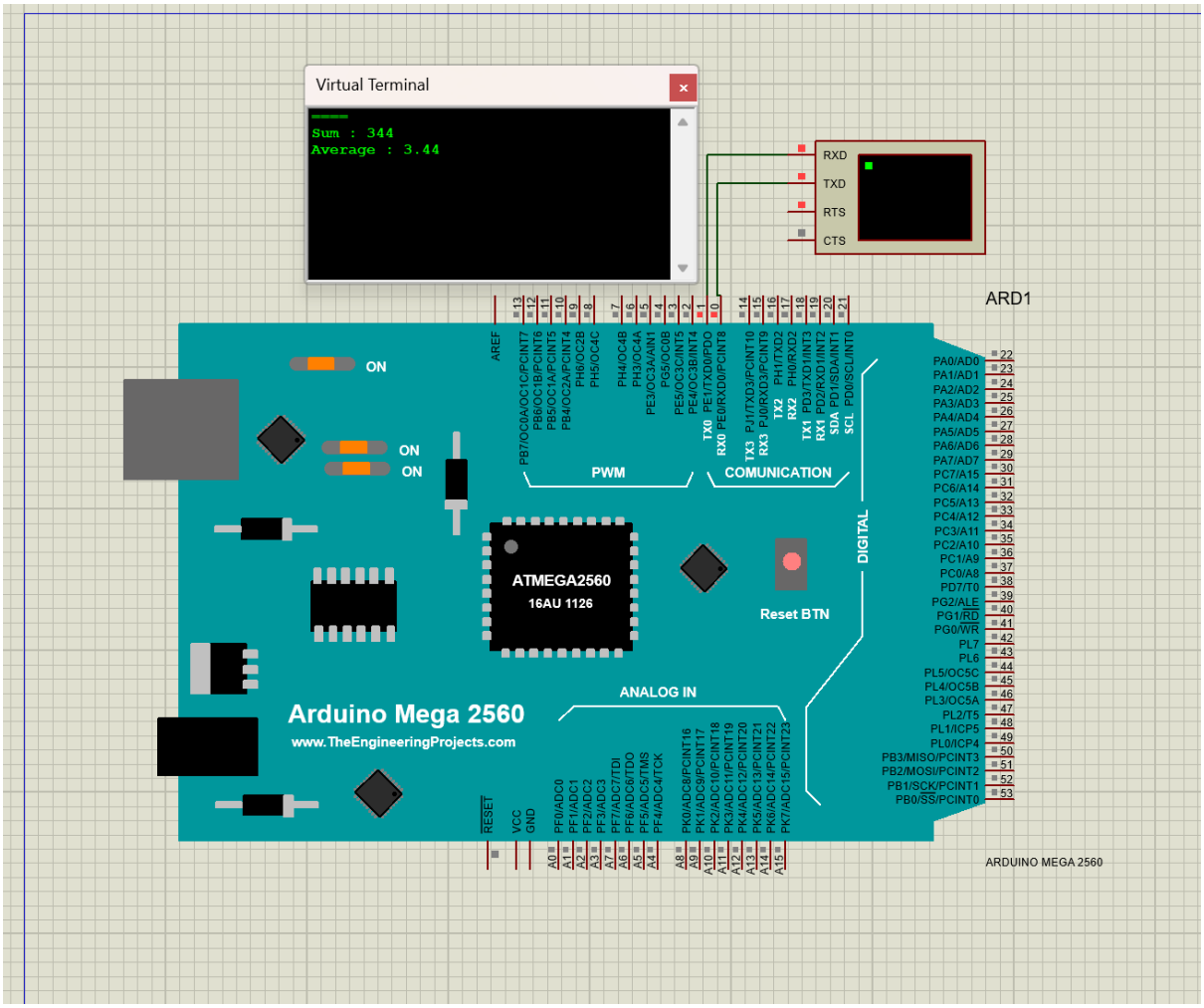
O0 :



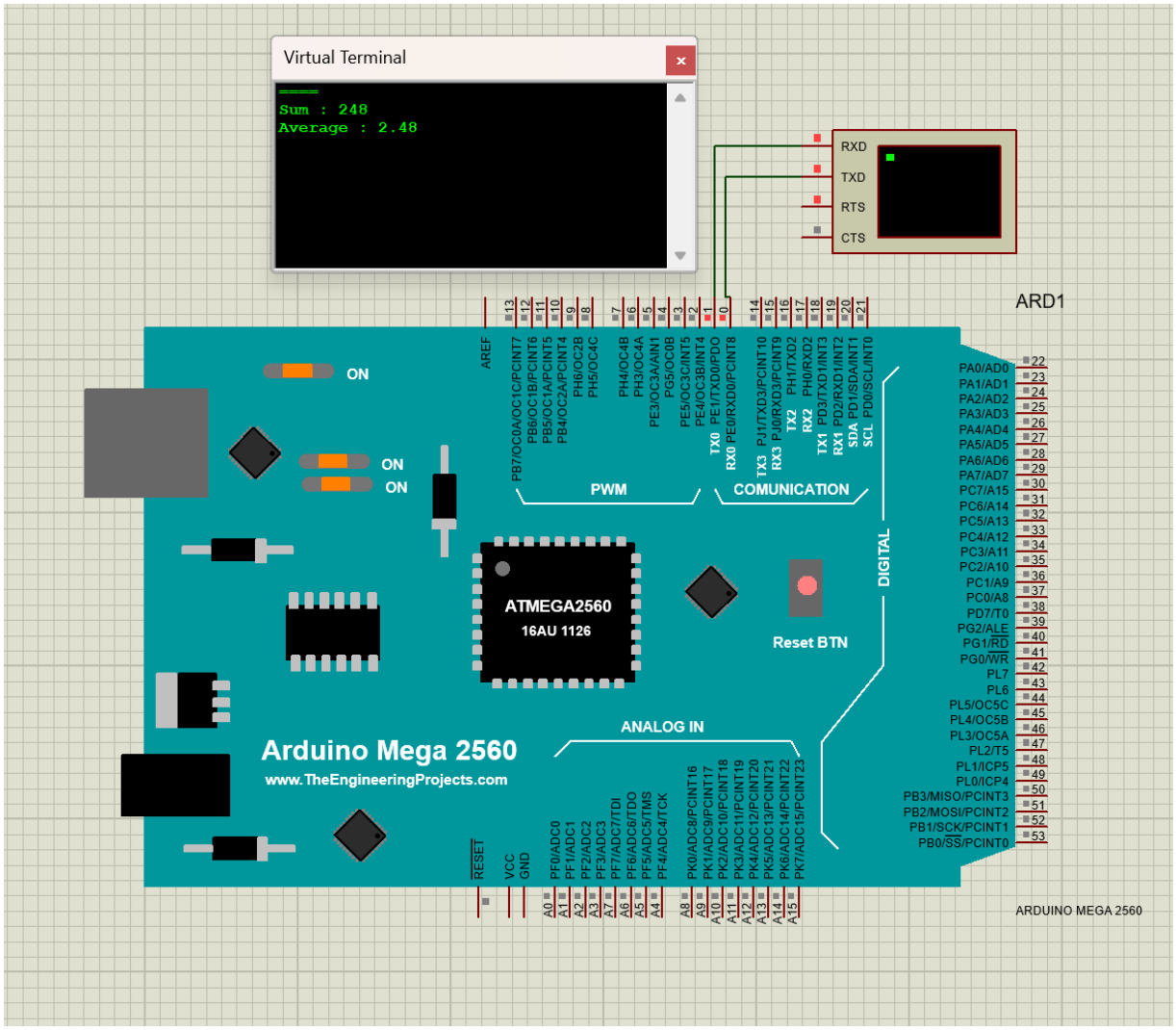
: O1


Virtual Terminal
Sum : 368
Average : 3.68
RXD
TXD
RTS
CTS
ARD1
ON
ON
ON
PWM
COMUNICATION
DIGITAL
ANALOG IN
ATMEGA2560
16AU 1126
Reset BTN
Arduino Mega 2560
www.TheEngineeringProjects.com
ARDUINO MEGA 2560

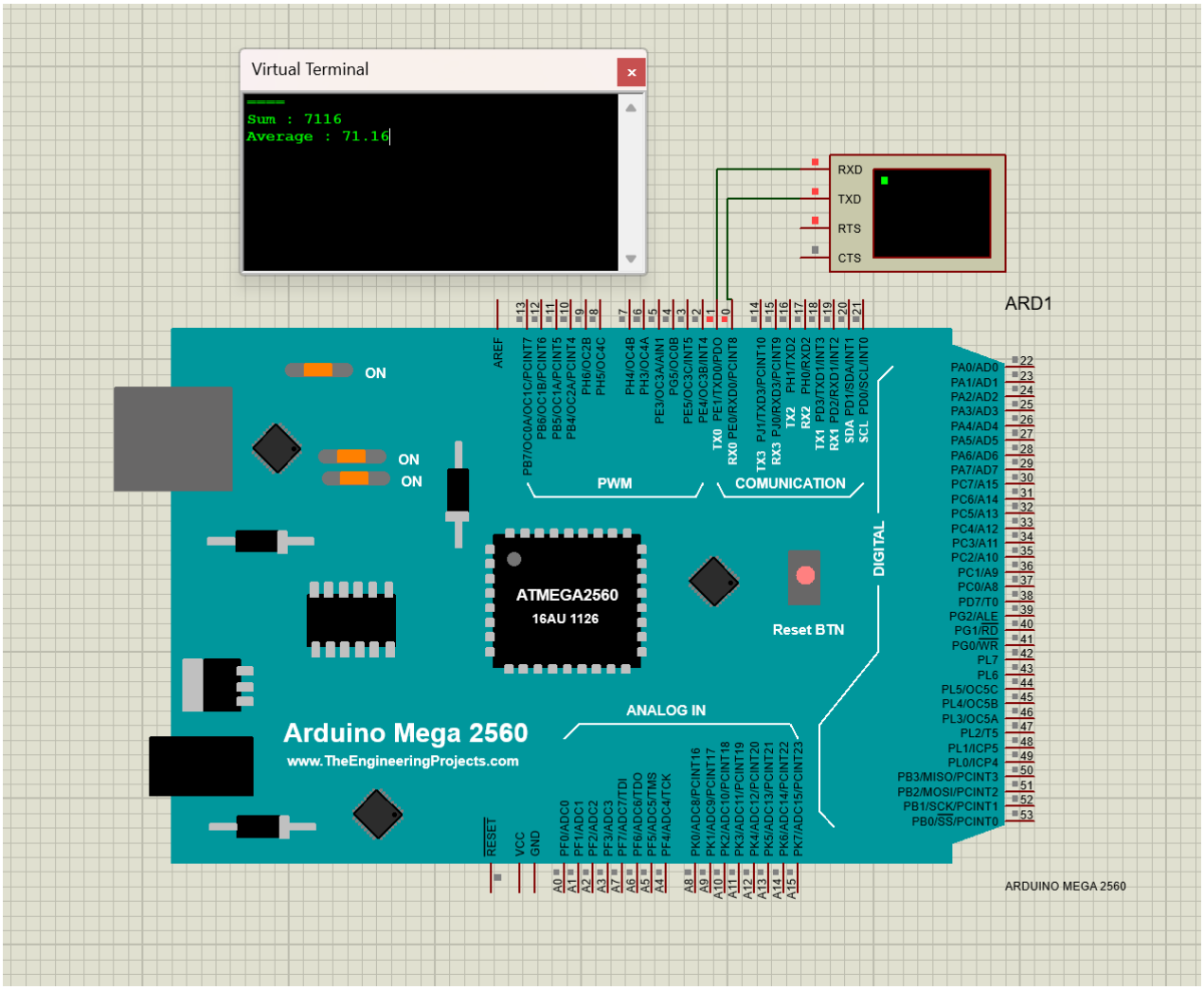
: O2


Virtual Terminal
Sum : 344
Average : 3.44
RXD
TXD
RTS
CTS
ARD1
ON
ON
ON
PWM
COMUNICATION
DIGITAL
ATMEGA2560
16AU 1126
Reset BTN
ANALOG IN
Arduino Mega 2560
www.TheEngineeringProjects.com
ARDUINO MEGA 2560

: O3


Virtual Terminal
Sum : 248
Average : 2.48
RXD
TXD
RTS
CTS
ARD1
ON
ON
ON
PWM
COMUNICATION
DIGITAL
ATMEGA2560
16AU 1126
Reset BTN
ANALOG IN
Arduino Mega 2560
www.TheEngineeringProjects.com
ARDUINO MEGA 2560

: Os


Virtual Terminal
Sum : 7116
Average : 71.16
RXD
TXD
RTS
CTS
ARD1
ON
ON
ON
PWM
COMUNICATION
DIGITAL
ATMEGA2560
16AU 1126
Reset BTN
ANALOG IN
Arduino Mega 2560
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