Sandhi
Open Source Visual Programming Software

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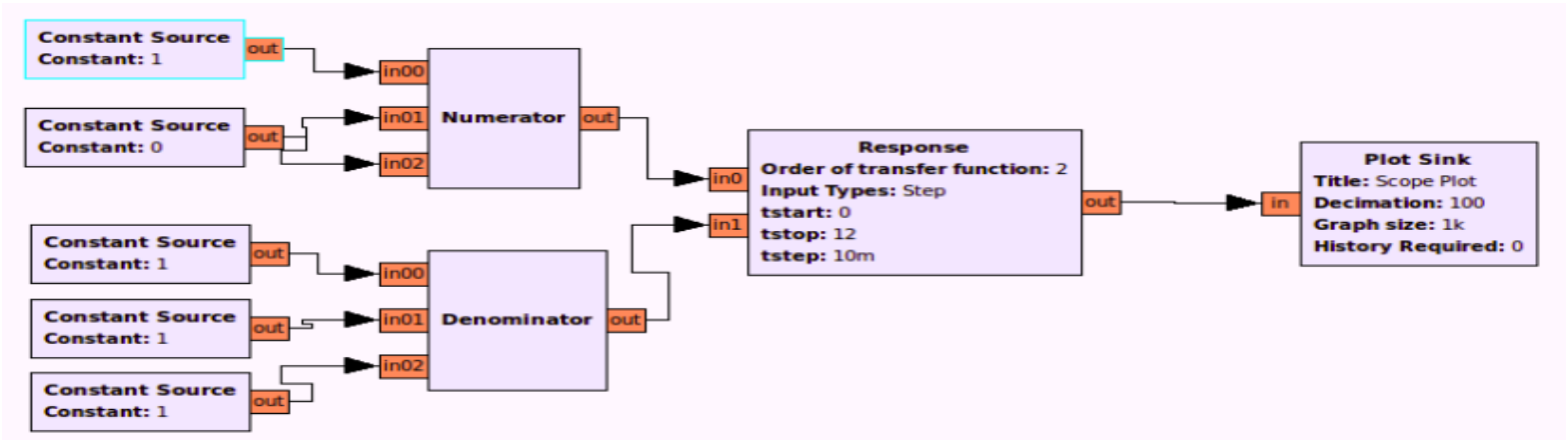
Introduction

- Sandhi is a visual programming editor based on GNU Radio
- Basic data structure in sandhi is the flowgraph
- It has been named Sandhi as it means connecting and conveys our idea of connecting various blocks to come up with a robust visual program
- Sandhi is aimed to become a visual programming tool for replacing LabVIEW

Flowgraph

- Flowgraph represents the connections of the blocks through which a continuous stream of samples flows
- The concept of a flowgraph is an acyclic directional graph with one or more source blocks (to insert samples into the flowgraph), one or more sink blocks (to terminate or export samples from the flowgraph), and any functional blocks in between.



Motivation to develop Sandhi

- Lack of proper open source alternative to LabVIEW.
- Expensive proprietary software.
- Being FOSS, it gives you freedom to modify, share and sell your application without any permission.

Development of Sandhi

- GNU Radio
- sciscipy
- GRAS

GNU Radio

- GNU Radio is a free and open-source software development toolkit that provides signal processing blocks to implement software radios.
- Supposed to be used by the Electrical Engineering community for the purpose of digital signal processing
- It has a rich module of implemented device drivers and thereby supports a range of devices

Why GNU Radio?

- GNURadio is a very promising visual programming tool as:
  - it make very easy for the developer to abstract his code
  - provides a very easy to use framework to the developer
  - it is open source

sciscipy

- Sciscipy is an Application Programming Interface
- Aimed for Inter Process Communication with scilab when in workspace of Python programming language

GRAS

- GRAS stands for GNU Radio Advanced Scheduler
- It was impossible to implement the feedback with GNU Radio, which uses stock application schedular **Note:** Application Scheduler is responsible for threading, controlling the data flow and managing the use of the computer resources like processor time to various processes.

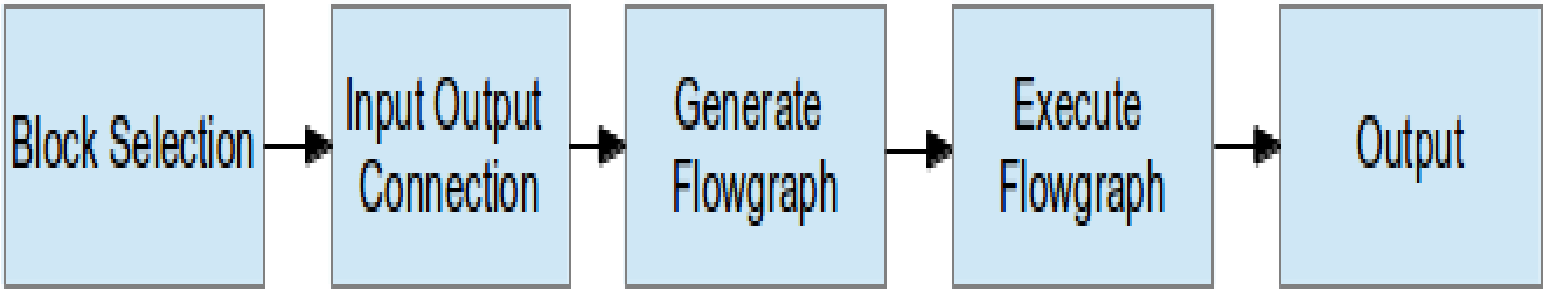
Block in sandhi

- Blocks are the basic building component of flowgraph
- Blocks have the property written in C++ or Python

How to create a block

- One can create a customized block with knowledge of C++ or Python
- Block developer have access to any library available in Python
- There are two files needed to create a block in sandhi:
  - Functionality written in C++ or Python
  - Properties written in xml file

Work Flow



- **Block:** A functional processing unit with inputs and outputs.
- **port:** A single input or output of a block.
- **Source:** A producer of data.
- **Sink:** A consumer of data.
- **Connection:** A flow of data from output port to input port.
- **Flow graph:** A collection of blocks and connections.

Experiments on sandhi: Data Aquisition

- Single Board Heater System(SBHS) can controlled using sandhi
- Using Python serial library, one can set the fan,heat value to SBHS and receive temperature value from SBHS

Experiments on sandhi: step response of transfer function

- To perform step response the flowgraph is created as follows
- Flowgraph uses Numerator, Denomenator, Response and plot-sink block
- These blocks has been written in Python and response of system is calculated in scilab using sciscipy