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UbiLAB

Virtual laboratory using Scilab

Multiplier Event 1 - Skopje

Host: Ss. Cyril and Methodius University in Skopje

01.02.2023

Outline

- Virtual laboratory using Scilab
- What is Scilab
- Simple example
- ATOMS Toolboxes
- Communication Toolbox
- What is Xcos?
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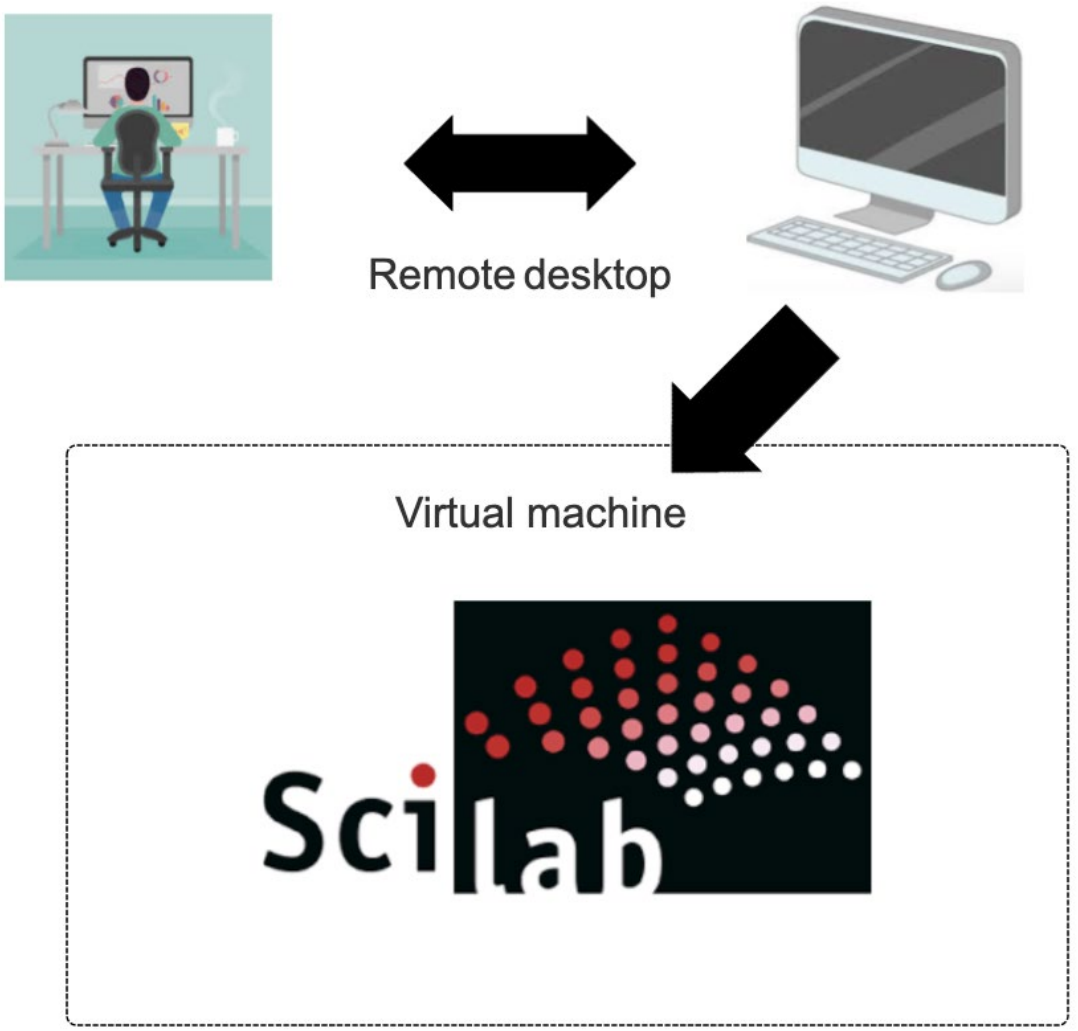
Virtual laboratory - Scilab



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What is Scilab? (1/2)

- A software package for scientific and engineering computing, quite similar to Matlab
- Scilab is tool for numerical computing, as are Excel, GNU, Octave, Matlab, etc.
- Included in Scilab package is Xcos, a graphic modeling and simulation tool.
- Scilab is free and can be downloaded at www.scilab.org
- Scilab is matrix-oriented, just like Matlab
- It allows matrix manipulations, 2D/3D plotting, animation, etc.
- It is an open programing environment that allows users to create their own functions and libraries

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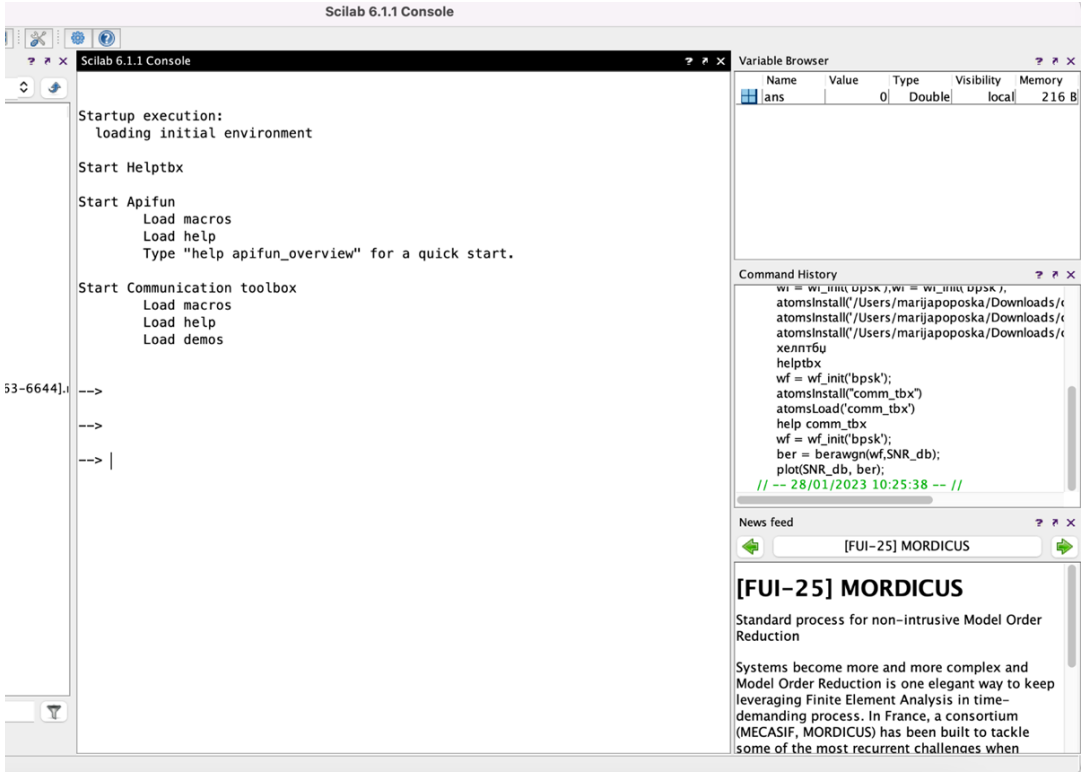
What is Scilab? (2/2)

- The Scilab language allows to dynamically compile and link other languages, such as C, C++, Java: this way, external libraries can be used as if they were a part of Scilab built-in features
- Scilab also interfaces LabVIEW, a platform and development environment for a visual programming language from National Instrument
- It includes Matlab-to-Scilab translator



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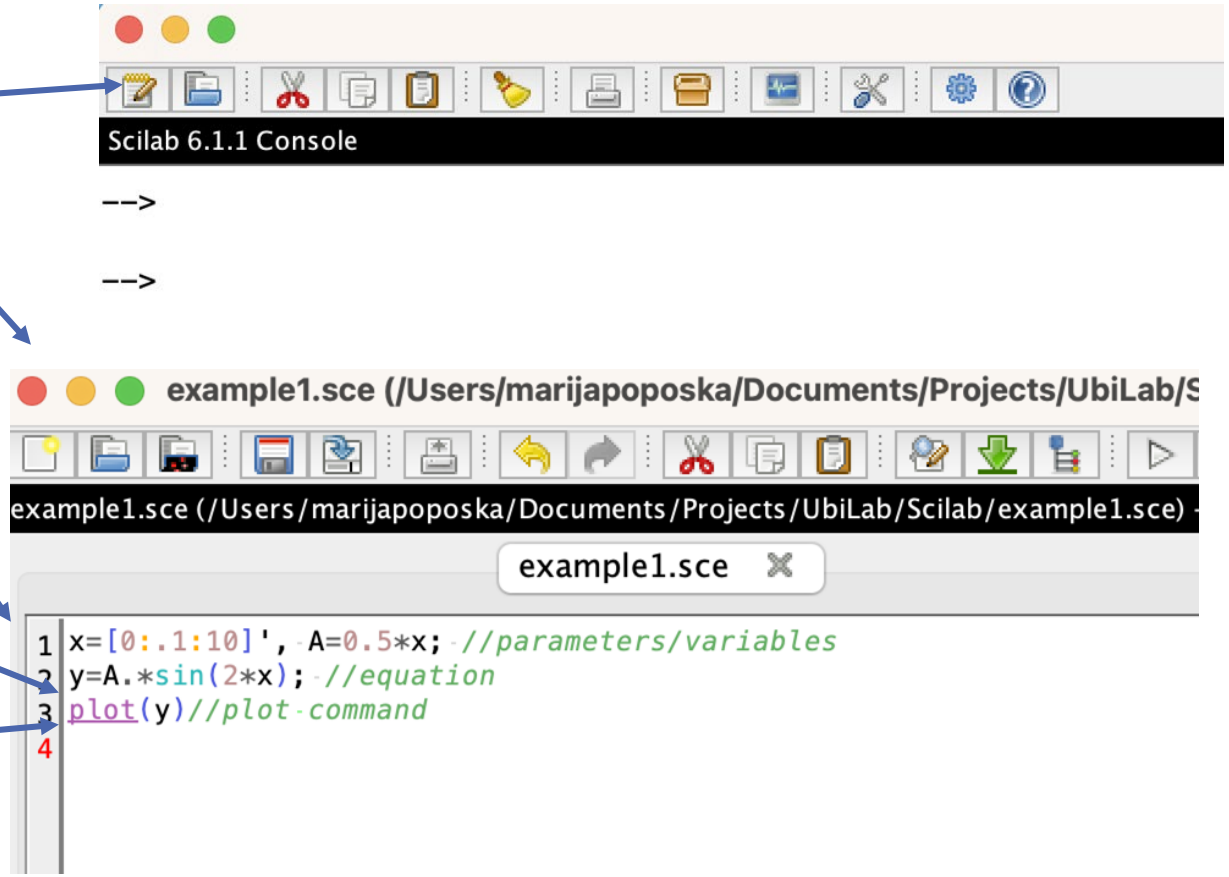
Simple example (1/2)

- Step1 : On the console, Click the leftmost icon on the toolbar, The Editor pops up
- Step 2: Define whatever variables your function needs
- Step 3: Next, define the function (in our case sin function)
- Step 4: Finally, write the needed command (in our case plot())



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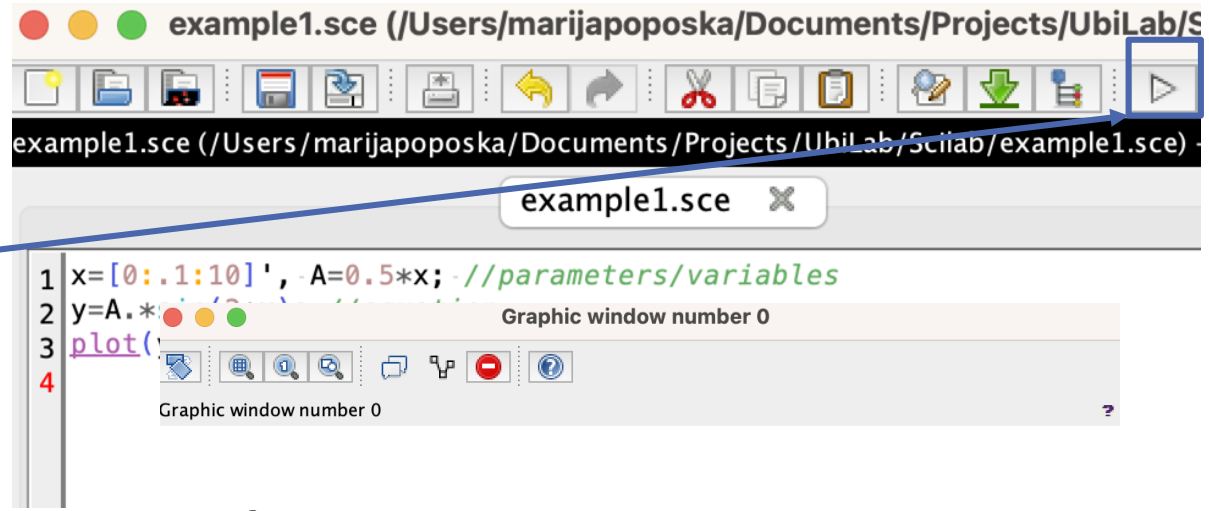
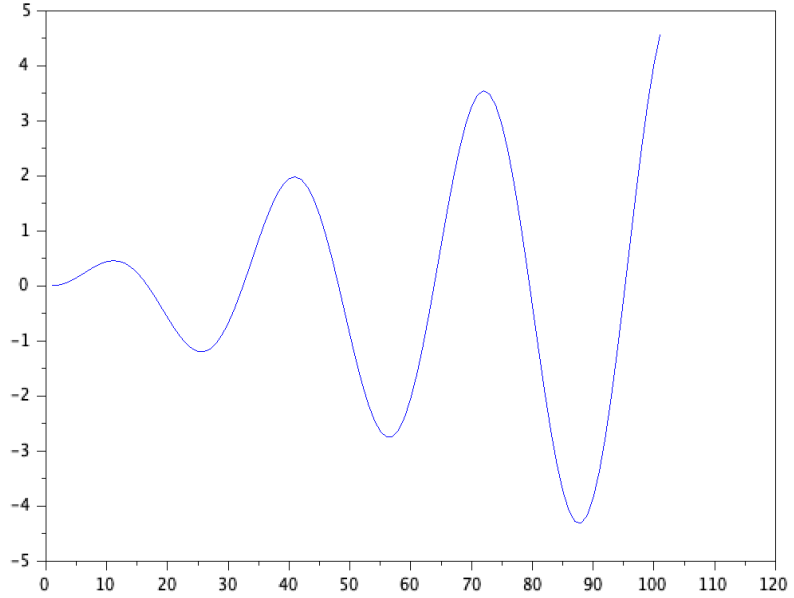
Simple example (2/2)

- Step 5: Finish by running (executing) the script by clicking the executing icon

- Step 6: Up pops the Graphics Window with the plot of the defined equation





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On scripts and functions

- Scilab has two command types:
  - Scripts: A set of commands used to automate computing. Script commands are normally returned to the Console, but plots are return to the Graphics Window
  - Functions (macros): Short programs that interface with the environment through input and output variables. A list of common built-in functions is given bellow. Functions defined by the user can either be local (integrated in script) or global (stored as a separate file and accessible to any script)

sin(), cos(), tan(), cotg(), asin(), acos(), atan()	trigonometric functions
sqrt(), exp()	square root/ exponent
sum(), min(), max()	sum, minimum/maximum value
abs(), sign()	absolute value/ sign
real(), imag()	real & imaginary parts of a complex numebr

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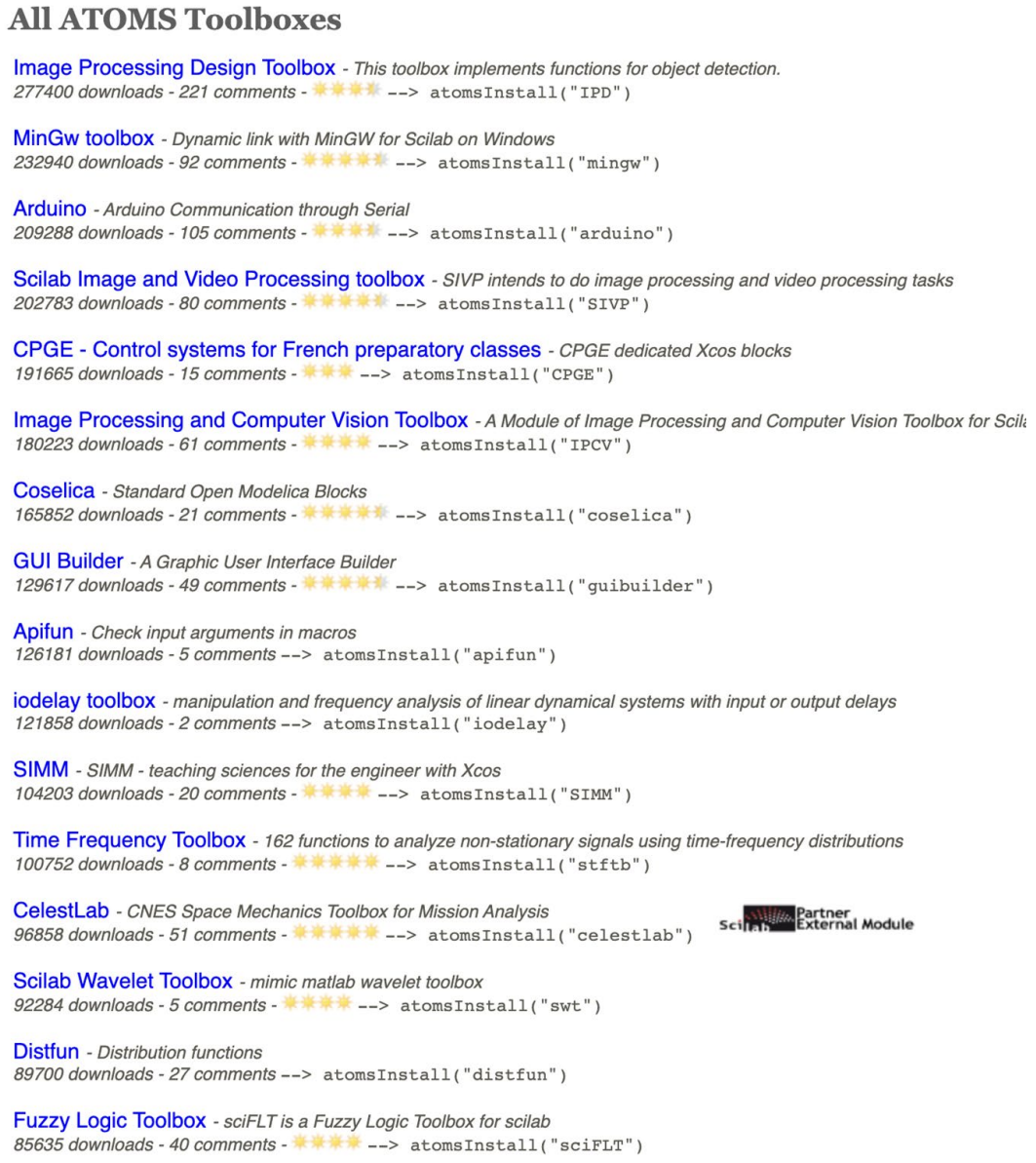
Scilab ATOMS - Toolboxes

- ATOMS (AuTomatic mOdules Management for Scilab) is the repository for packaged extension modules ("Toolboxes").
- https://atoms.scilab.org/



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Communication Toolbox

- A toolbox for telecommunications http://www.tsdconseil.fr/log/sct/
- Goals/ usage examples:
  - Facilitation of prototyping modulators/demodulators for RF links
  - Analysing/plotting of data obtained from other programs
  - Generating data for real time implementation
- Toolbox sub-modules
  - modulations: classical waveforms (FSK,PSK,etc), modulation and demodulation algorithms
  - sym-gen: Several functions to generate binary sequences (alternating 010101, pseudo-random)
  - simulation: Propagation channel simulation (AWGN channel, fading)
  - channelization: frequency multiplexing/demultiplexing

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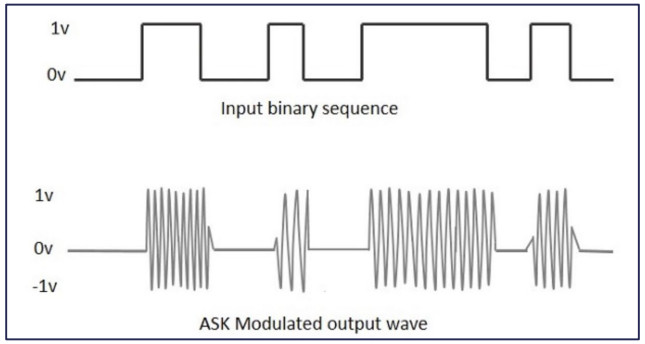
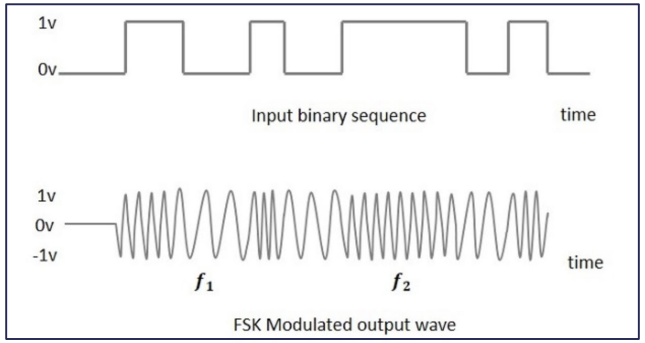
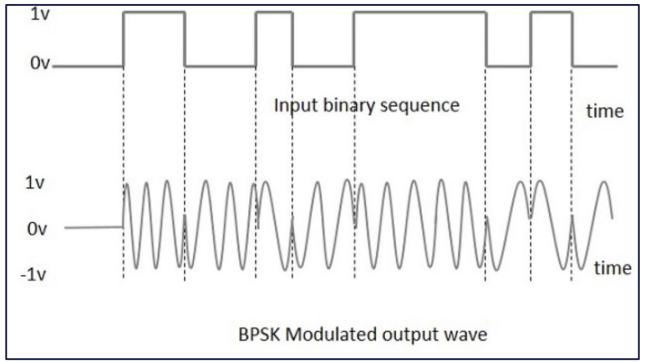
Laboratory exercise 1: Digital modulations (1/2)

- ASK (Amplitude Shift Keying) is a type of Amplitude Modulation which represents the binary data in the form of variations in the amplitude of a signal.
- FSK (Frequency Shift Keying) is the digital modulation technique in which the frequency of the carrier signal varies according to the digital signal changes.
- PSK (Phase Shift Keying) is the digital modulation technique in which the phase of the carrier signal is changed by varying the sine and cosine inputs at a particular time. PSK technique is widely used for wireless LANs, bio-metric, contactless operations, along with RFID and Bluetooth communications.







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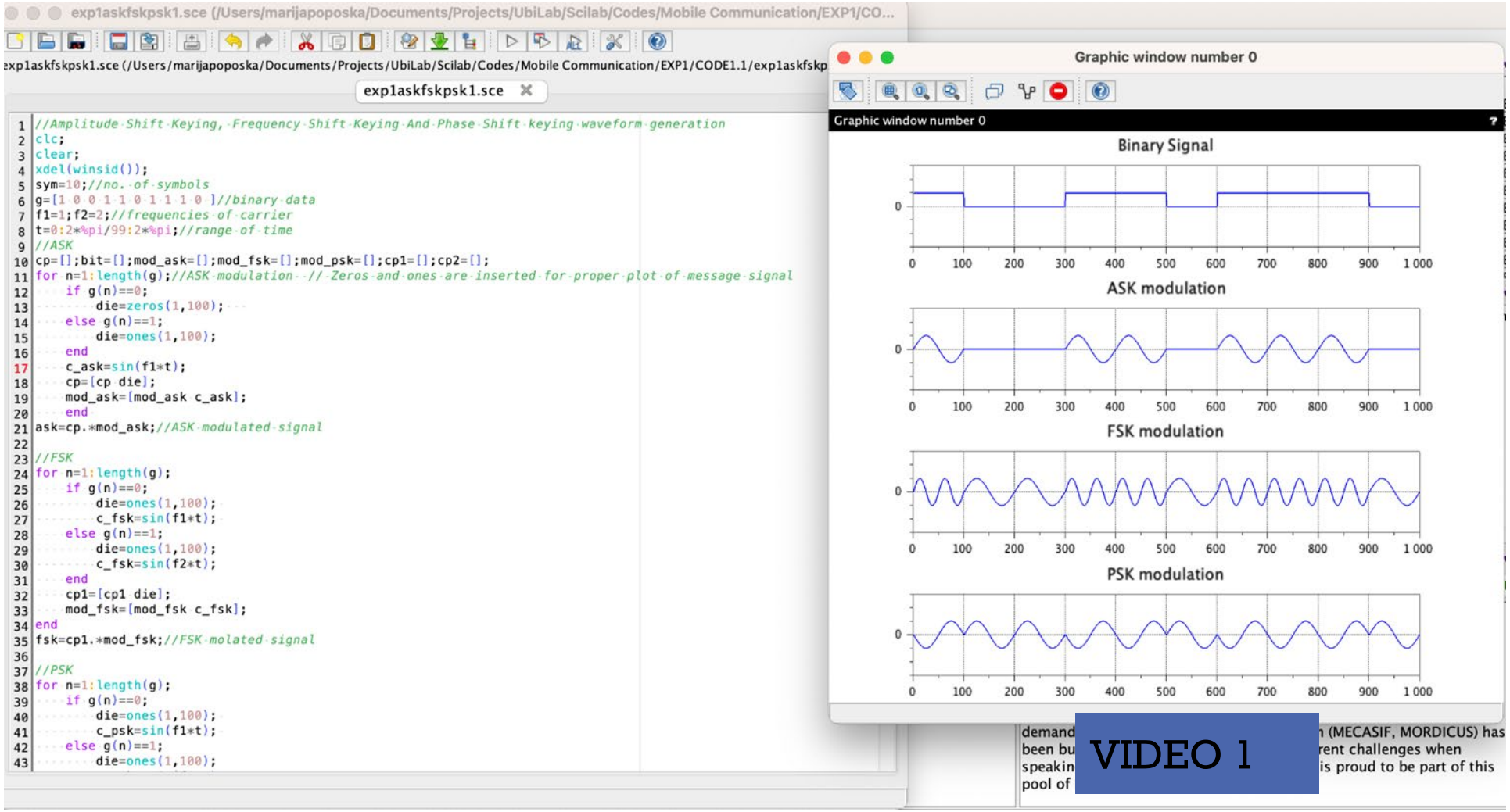
Laboratory exercise 1: Digital modulations (2/2)



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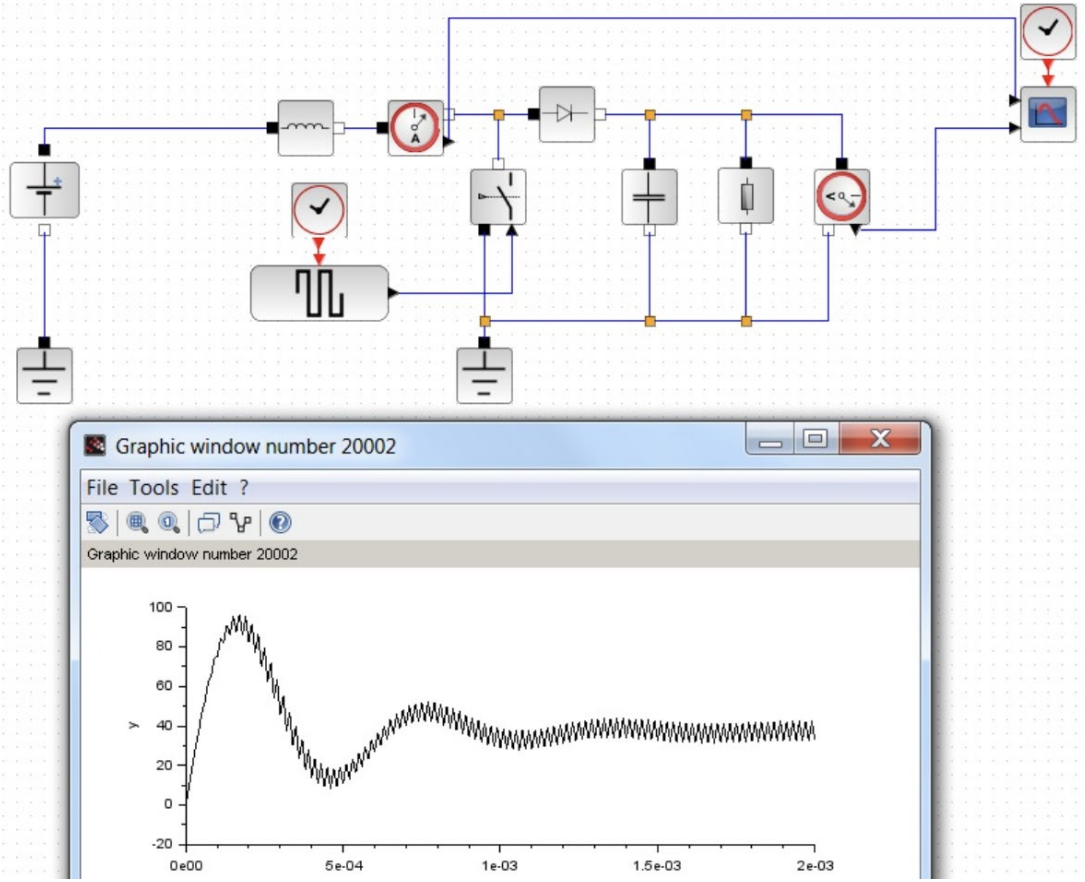
Scilab Xcos

- Xcos in Scilab is tool dedicated to the modeling and simulation of hybrid dynamic systems including both continuous and discrete models
- Xcos includes a graphical editor which allows to easily represent models as block diagrams by connecting the blocks to each other
- Each block represent a predefined basic function or a user-defined one.



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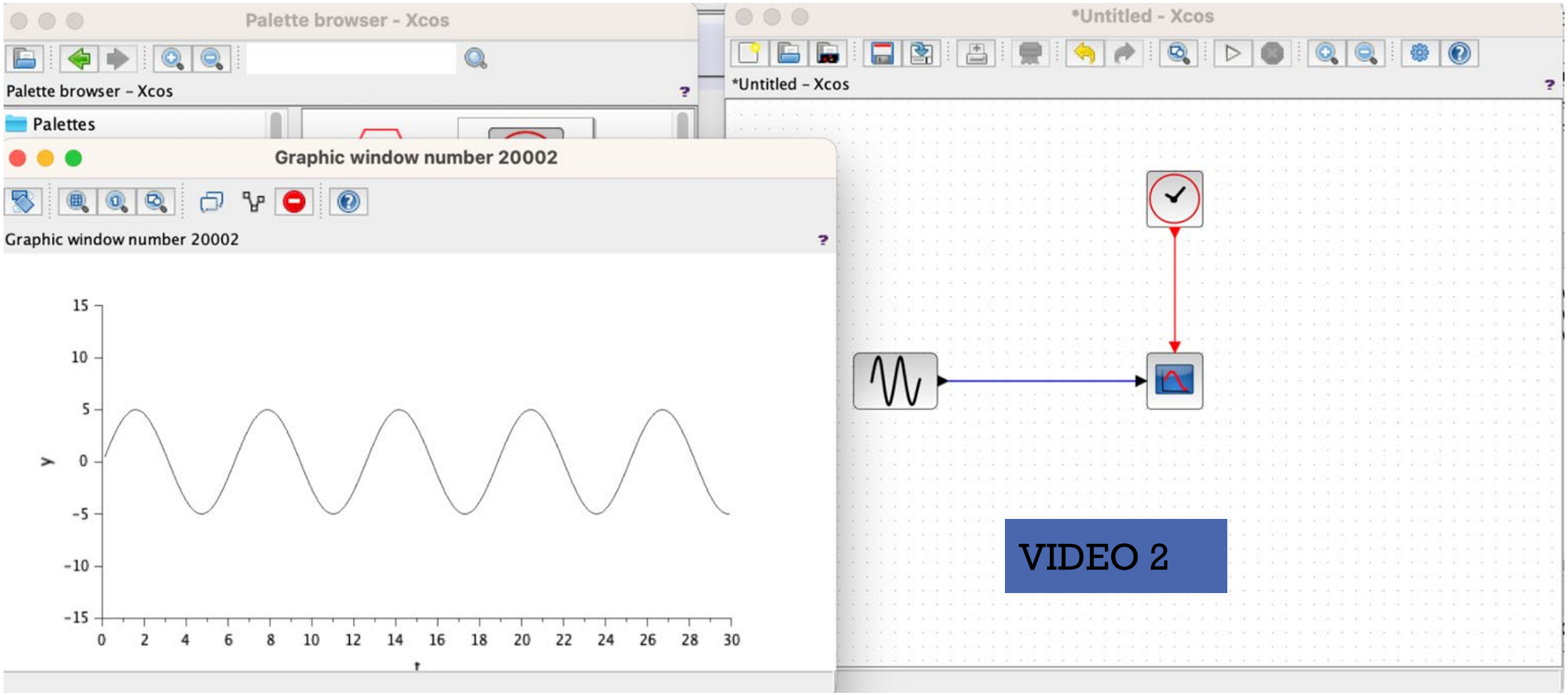
Simple example using Xcos



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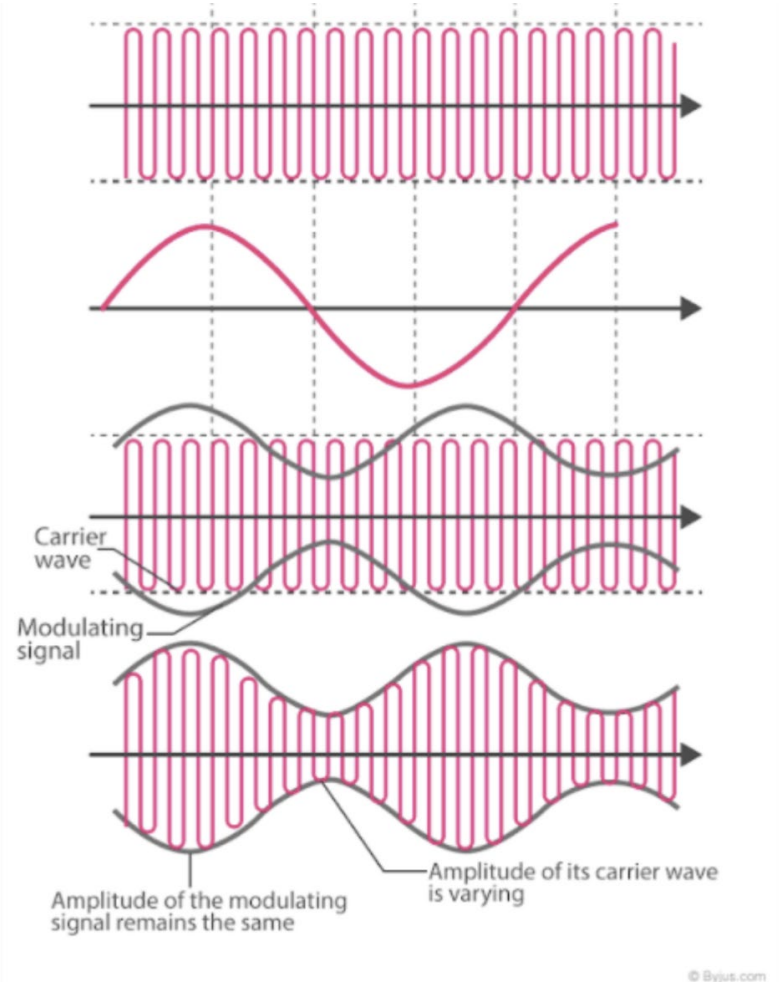
Laboratory exercise 2: Amplitude Modulation (1/2)

- Amplitude modulation is a process by which the wave signal is transmitted by modulating the amplitude of the signal.
- It is often called AM and is commonly used in transmitting a piece of information through a radio carrier wave. Amplitude modulation is mostly used in the form of electronic communication.



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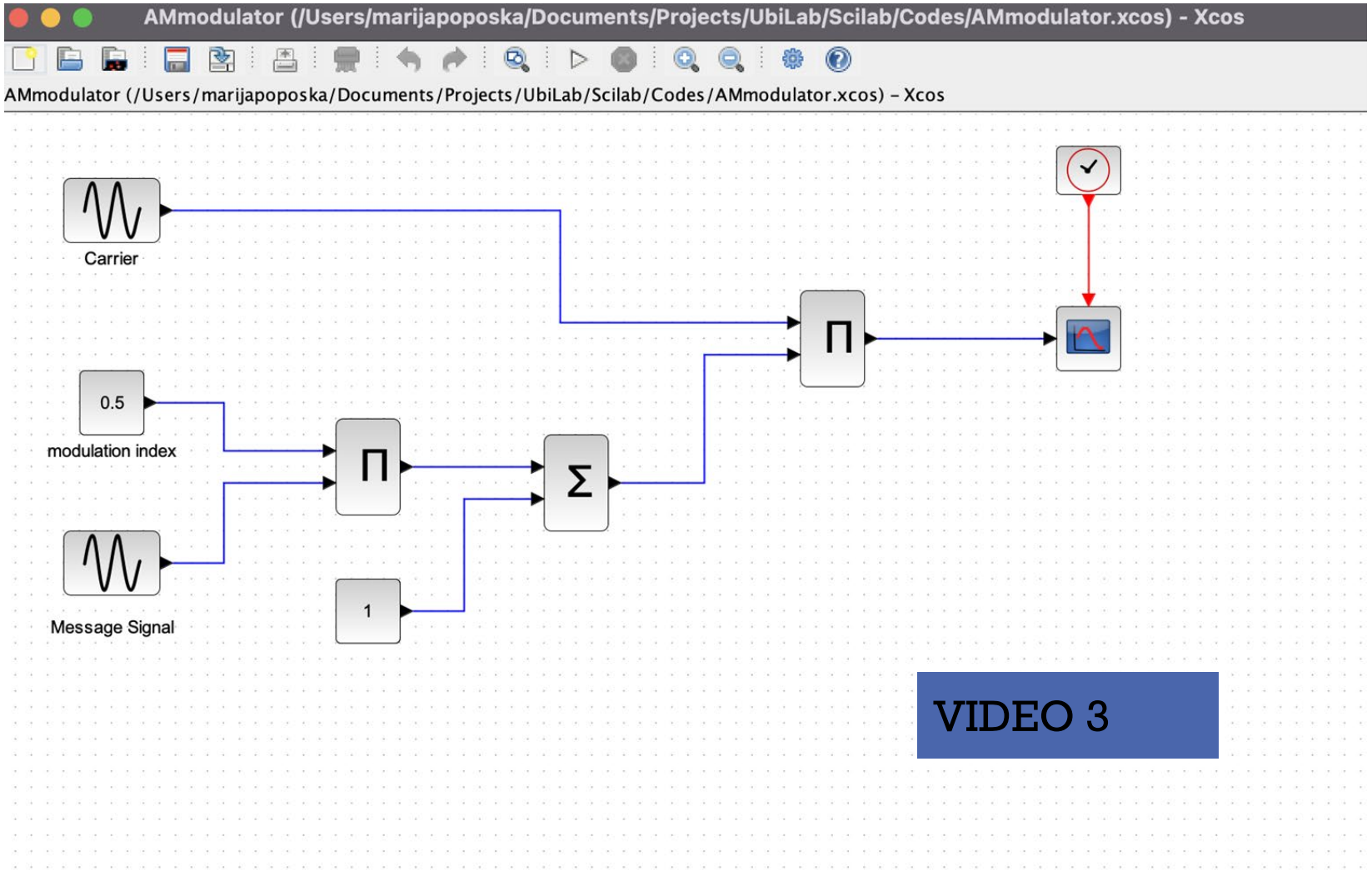
Laboratory exercise 2: Amplitude Modulation (2/2)



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