

Algorithms and methods for optical signal processing¹

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Numerical modeling for individual waveguide-based photonic devices and optical signal processing methods are of paramount importance for the design and characterization of optimized real-work optical signal based transmission systems. Nowadays there are many individual software tools that refer particular study area of optical systems. The categorized group diagram is presented in Figure 1 with focus square on the aim-idea of the project.

The specific objectives refer **1.** to start with optical individual integrated components simulation that will be incorporated into an optimized optical system **2.** to develop algorithms collection (detection, estimation, optimization and filtering) for signal processing and the third step **3.** to develop an Open-Source upgradeable end-user design software tools that includes components (step 1) and signal processing (step 2) in order to implement a real request specific application, specially *optical sensor based*.

Optical Sensors offer a definitive solution for monitoring extreme parameters associated with security and safety applications. While the advantages of such sensors are known, in terms of stable and reliable behavior in:

- extreme physical conditions - high temperature (up to 1400C), low temp (near abs. zero), high pressure
- environmental hazards - toxic chemicals, radiation, explosive substances
- monitoring and evaluation of existing structures as well as for early detection of damage and stability risks,

there are a number of identified technical problems yet to be resolved: long term measurements fundamentally uncertain because several impacts on the measurement result (aging, delaminating, temperature, etc.) cannot be separated from the real measurand response (such as electro-optic, magneto-optic, thermo-optic, acousto-optic effect).

Signal processing overlaps with the study traditionally known as *controls*, since control ultimately involves producing a signal based upon measured output of a system by means of some processing upon that signal.

When field trials and even laboratory experiments are too expensive or pay some risks due environmental conditions, numerical simulations play a key role in optical sensors system design. Simulation tools provide a wide range of capabilities, including various realistic sources of noise, nonlinear effect, polarizations etc. facilitating detailed studies of signal propagation in realistic-scenario conditions.

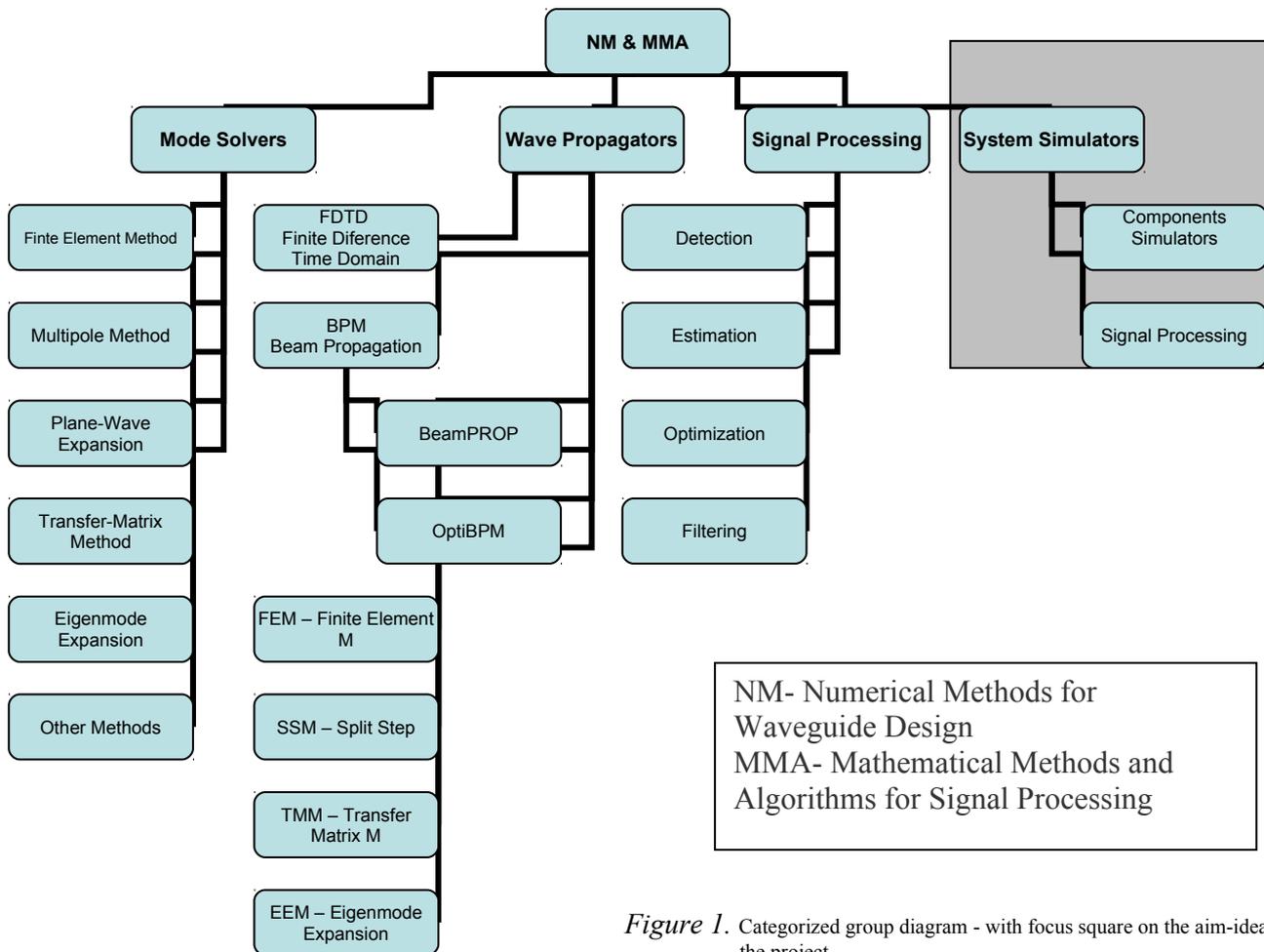


Figure 1. Categorized group diagram - with focus square on the aim-idea of the project

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