RESULTS ANTICIPATE of DEVELOPMENT RIS IN UKRAINE

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We are all and everything that surrounds us, is in movement i.e. in a dynamic condition. Therefore, all considered and studied processes should be considered in dynamics condition. However, dynamic processes can be "significant" and "insignificant" depending on the scale of the space and time where and when they occur.
We introduce the concept of "scale factor" to determine the degree of significance of the impact of dynamic processes in research. In order to explain why we needed to introduce this concept, let's try to answer a philosophical question. What primary is matter or consciousness? The answer is simple and both exist "always" (as for time) and "everywhere" (as for space), because both are "infinite". This leads to apparent proofs that mathematical regularity in different scales are displayed differently or not work at all with the approach to (+) or (-) infinity.

The purpose of this work is to conduct research in the field of modeling of dynamic processes of the environment during the movement of the vessel, as well as to determine the qualitative characteristics of "significance" when using the proposed 5th element of the spatial dimension "scale factor".
Modern technologies allow us to derive an image of the vessel in dynamics way in interaction with the environment, taking into account the selected parameter "scale factor".

In determining the "significant" scale will be based on the parameters of the object of study, as well as the choice of "sufficient" amount of time required for this scale. These are the geometric dimensions of the vessel, sediment, deadweight, displacement, the area of interaction with the elements of the environment (wind, wave, current, depth, etc.) and the time interval at which you can set the characteristic patterns. In this paper we analyze the existing models of the environment in dynamics and try to find patterns of impact on a moving ship in this environment.
According to the principle of construction of mathematical models are divided into analytical and simulation. In analytical models, the processes occurring in the environment can be represented as functional dependencies, which are used:

– equations;
– approximation problems;
– optimization problem.

In the simulation by preliminary measurements, which are the initial data, it is possible to simulate the dynamics of the process at a certain period of time, but the prediction of the dynamics is very difficult.
DIFERENT SCALE OF TIME IN THIS MODELS

chart dynamic model consist from

Sea/river bottom dynamic model & Sea/river surface dynamic model

CDM
In real time

S/R-BDM
per month

S/R-SDM
per minutes
1. water level dynamic model
2. sea/river bottom dynamic model
3. ships mooving model
**Task 1.**

Navier-Stokes is main equation for task 1. 

Thermocapillary Marangoni effect, thermocapillary convection, Benard-Marangoni convection. Investigation of the nonlinear Korteweg-de-Vries (KdV), Kura-moto-Sivashinsky equations (CS), Burgers, etc. evolution of the free surface of a liquid.

Differential equations of fluid motion

The integral of Euler's equations of motion for a steady flow is the Bernoulli equation.

Frouda Criterion, Euler Criterion, Reynolds criterion.
Dynamic of sea surface – satellite image
Reference surface in dynamic

sea surf. height  Dec 15, 2015 00Z  [91.1H]
**Task 2**

Kinematic Model, Hypothetic Model

D - the model is deterministic; there is no (more precisely, it does not take into account) the influence of random processes.

H - model is continuous, information and parameters are continuous.

A - is an analytical model, the functioning of the model is described as equations (linear, non-linear, systems of equations, differential and integral equations)
моніторинг з повітря
Загрузка...
**Observations**

- Satellite altimetry
- Sea surface altimetry model
- Sea (river) level measurement
- Chart dynamic model (CDM)
- Current (speed, direction, depth)
- Depth measurement (3D, isoline)
- Waves (long, height, direction)
- Wind (direction, speed, frequency)
- Multivariate analyses
  - $F_{x,y,z}$ function
  - $F_{x^*,y^*,z^*}$ function
- Chart dynamic predict
- Amendments & comparison
- Time-scale
- Evaluation
- Comparison
- Mathematic statistic
- Chart dynamic predict
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**Chart Dynamic Model**

- Sea (river) bottom model
- Sea (river) surface model
- Multivariate analyses
Depth contours dynamic in chart
2013-2016 years observations
День 1
Task 3
All existing mathematical models of ship motion can be divided into three categories:
a) linear models;
b) partially linearized models;
c) nonlinear models.

No model is absolutely perfect, none always provides acceptable accuracy! There is need take into account "scale factor".
Choose the mathematic Model

Dynamic Model of Choosing area

In due course of dynamic forecast

Model Evaluation, Probability

D RIS Index
Using Dynamic Model via D RIS Index of Area N

NtS \rightarrow \text{D RIS index encoding} \rightarrow \text{IENCE}

IMAGE/symbol

DM
Inland Aids to Navigation
Unmanned Surface Vessels (USVs)

- HYPACK working with:
  - Teledyne Oceancience Z Boat
  - Searobotics
  - ASV, Ltd.

1) Collect on vessel with Autopilot (Ready!)
2) Collect on vessel, control from shore (Ready!)
2) Collect on shore, control from shore (working on it....)
Monitor, economize and provide reports for trailing hopper, cutter suction, excavator and bucket dredges. NOT FOR SURVEY.
Real time dredging software to show you where is the digging tool, how deep is the design depth, and keep a history of the digging operation.
DREDGEPACK®

Cutter Suction Dredges

Excavators

Hopper Dredges

Bucket Dredges

DREDGEPACK is compatible with cutter suction, hopper, crane and excavator operations. The Silent Inspector routines meet USACE reporting guidelines.
Monitor, economize and provide reports for trailing hopper, cutter suction, excavator and bucket dredges. NOT FOR SURVEY.
There is to hard discussion about remote handling vessels

Our opinion: We have to be ready to take into account for toward of progress

Because as we see above, safety navigation challenges exist and now too
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