Prof. Dr. Mykola Tkachuk
tka.mobile@gmail.com, tka@kpi.kharkov.ua
Promising "Agile-Domains" for PhD Research

• “Agile - Research Domain”: What does it mean?
  From my (maybe subjective) point of view for such a domain the following characteristic features are typical

  - really new and modern scientific problems and technological platforms ...
  - complex and weak-formalized requirements / tasks to be resolved ....
  - a lot of changes and rapid development trends are in progress.....
  - an important role of human-centered factors in system design and operating...
  - ..... (to be continued) .......

ICTERI-2017 / Kiyv / May 15-18, 2017
But research challenges are:

- How to build a **Product Backlog in effective way** (w.r.t. domain specific features)?
- What is a way to **prioritize Requirements correctly** for any Sprint Backlog?
- What about some **methods and metrics** to organize “control loops”: Daily meeting and Sprint meeting?
- How to provide **Finding&Feedback** in Scrum process w.r.t. such criteria as Software Quality attributes?
- … **to be continued …..**
A possible approach: Cybernetic-centered scheme of Scrum-method

- Several process control loops can be organized …
- Feedback-control using target quality metrics have to be used …
Traditional development: Any specific problem from the given Problem Space is solved by creating different applications, each of them has to be developed in a unique manner.

Disadvantages: lack of the reusable components; high project costs ....

DSM&DDD: Problem Space is divided into a set of domains, for each domain a specific domain model has to be constructed, that later is transformed into appropriate software solutions.

Advantages: Reuse of domain models (knowledge) when developing new applications; decrease of total costs in software development.....
How to formalize initial domain knowledge in order to build an appropriate domain model (DM)?

How to classify domain specific methods to DM realization, w.r.t. reuse different project assets: domain knowledge, requirement specifications, architectural solutions, source code, etc.?

What are suitable expert methods and quantitative metrics to assessment of different practice-oriented reusable assets, e.g. code reuse extend?

How to estimate a domain model complexity / code reuse extend, e.g. how to estimate finally an efficient ratio of DSM & DDD usage?

..... to be continued .....
The most suitable way to classify DA and DSM methods is to consider them by type of phases or artifacts to be reused in a software development process.

Result: we can conclude that domain modeling by usage of ODM / EMF tools provides the essential higher extent of code reusability (CR) than by using of JODA method and Actifsource tools.
Post Object-oriented Technologies for Software Development and Maintenance

http://www.hpi.uni-potsdam.de/hirschfeld/projects/jcop/index.html; https://www.hpi.uni-potsdam.de/hirschfeld/trac/Cop/wiki/JCop


http://wwwiti.cs.uni-magdeburg.de/iti_db/research/featureide/
Advent of new Software Development Approaches

Research challenges:
- To build classification (taxonomy) of new Post-OOP (POOT) approaches w.r.t. their features and purpose of usage: e.g. to eliminate a cross-cutting functionality, to decrease a number of programs bugs, etc.?
- How to define an appropriate type of legacy software system to be adopted with a given POOT?
- How to estimate an effort needed to modify a legacy software system with a target POOT?
- What criteria and their metrics can be used in order to evaluate an effectiveness of POOT usage?
- … to be continued ……
A possible multi-dimensional approach to comprehensive estimation of POOT effectiveness …

Effect \Rightarrow Criteria (SystemType, POOT - efforts)

Effectiveness Estimation?
Models, Methods and Tools for Adaptive Mobile Systems Development

Mobile information system

Navigation system
- 1) intensive GPS usage;
- 2) intensive usage of data transfer network.

Task management system
- 1) low computational load on mobile device;
- 2) usage data transfer network depends on features system e.g. data synchronization, media content storage, etc.

Augmented reality system
- 1) high computational load on mobile device;
- 2) intensive GPS and build-in gyroscope usage;
- 3) built-in camera usage.

Social network client
- 1) low computational load on mobile device;
- 2) intensive usage of data transfer network;
- 3) displaying of huge volume and different types of multimedia data.
Some R&D problems on example of Augmented Reality (AR) Geolocation System

**AR-geolocation**: uses GPS-module to detect coordinates; digital compass and gyroscope to detect mobile device position and camera to analyze physical environment to provide additional information about objects from the real environment which are shown on mobile device.

**Typical Problems / Constraints in Development of mobile AR systems**
- Restricted CPU performance, RAM and battery capacity …
- Small screen size on mobile devices …
- No possibility to extend hardware performance of mobile device in run-time mode ….  
- needs to support applications on different types of mobile devices

**Research & Development challenges:**
- How to elaborate models and metrics to quality estimation of AR-systems?
- How to manage restricted AR-resources effectively?
- What types of distributed software architectures and technological solutions can be used to implement adaptive AR-systems?
- ... to be continued ......
Main disadvantages: sequential workflow, “hard-coded” business logic, some initial requirements become no more actual, a lot of changes are not taken into account, solution quality issues can be estimated too late...
Agile-Workflow for PhD – research: “Scrum – oriented” vision ....

Main scientific points
to be resolved (“Product Backlog”)

Prioritized list of
current tasks (“Sprint
Backlog“)

Scientific Advisor
(“Product Owner”)

“Scrum team”: PhD - student
+ master students)

Small iterations (“daily scrum meeting”):
share current results intern, discuss
problems, analyze risks / bugs, etc.

“Sprint” iterations ->:

: -> Check and revise initial scientific
points, get critical remarks, improve
research concepts via reporting on public
seminars, participating on relevant
conferences (e.g. like ICTERI ....) etc.....

Your profit: flexible workflow, “agile” business logic, any requirements / tasks can be considered in time, all
changes are performed iteratively, solution quality issues can be estimated / improved step by step .......

5/22/2017

Your profit: flexible workflow, “agile” business logic, any requirements / tasks can be considered in time, all
changes are performed iteratively, solution quality issues can be estimated / improved step by step .......

5/22/2017
Our selected international publications in “agile” – research domains...


Thank you for your attention!