INTEGRATED ONTO-BASED INFORMATION ANALYTICAL ENVIRONMENT OF SCIENTIFIC RESEARCH, PROFESSIONAL HEALING AND E-LEARNING OF CHINESE IMAGE MEDICINE

Lupenko S. A., Orobchuk O. R.,

Ternopil Ivan Pului National Technical University, Ternopil, 56 Ruska Street

Vakulenko D.V., Sverstyuk A. S., Horkunenko A. B.,

I Horbachevsky Ternopil State Medical University, Ternopil, 1 Maidan Voli

The urgent matter of the development

According to the WHO traditional medicine strategy [1], the regulations of the Ministry of Health of Ukraine [2] the Program of Chinese image medicine research for 2017-2023 [3], and along with the need for CIM admittance into the integrative medicine as an evidence-based healthcare branch, the creation of an integrated onto-based information analytical environment of scientific research, professional healing and e-learning is topical scientific and applied issue.

The purpose of development

This development of information analytical environment is aimed to ensure the effective organization and coordination of existing practitioners of Chinese image medicine, scientific researchers of CIM and people who study CIM, as well as the establishing of contemporary intellectualized information means and resources in traditional, complementary and integrative medicine on a national and worldwide basis. The main users of the information environment are CIM therapists, students attending a course (online as well) in CIM, CIM scientists and researchers.

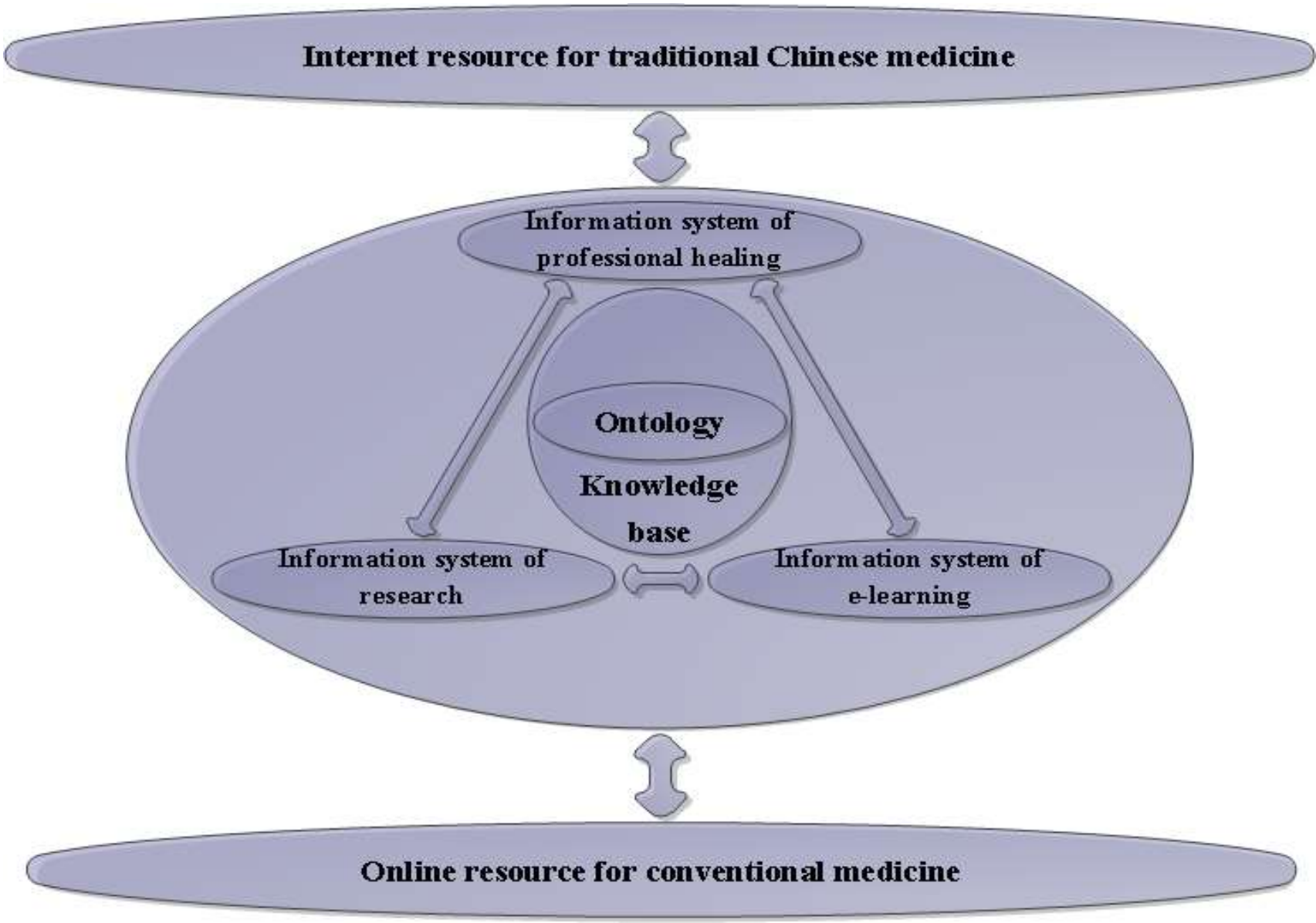
General requirements for information analytical environment

- Integrated onto-based information analytical environment should include the following systems as its components: information system for professional healing Image Therapist (ISPH Image Therapist), CIM knowledge-base (CIM KB), expert system for diagnostic and therapeutic decision-making support in CIM (ES CIM), CIM e-learning information system (CIM EIS), information system for CIM research (ISR CIM).
- The information environment should be based on ontological approach and ontological models of CIM and be consistent with previously developed ontologies for traditional Chinese medicine and conventional (Western) medicine.

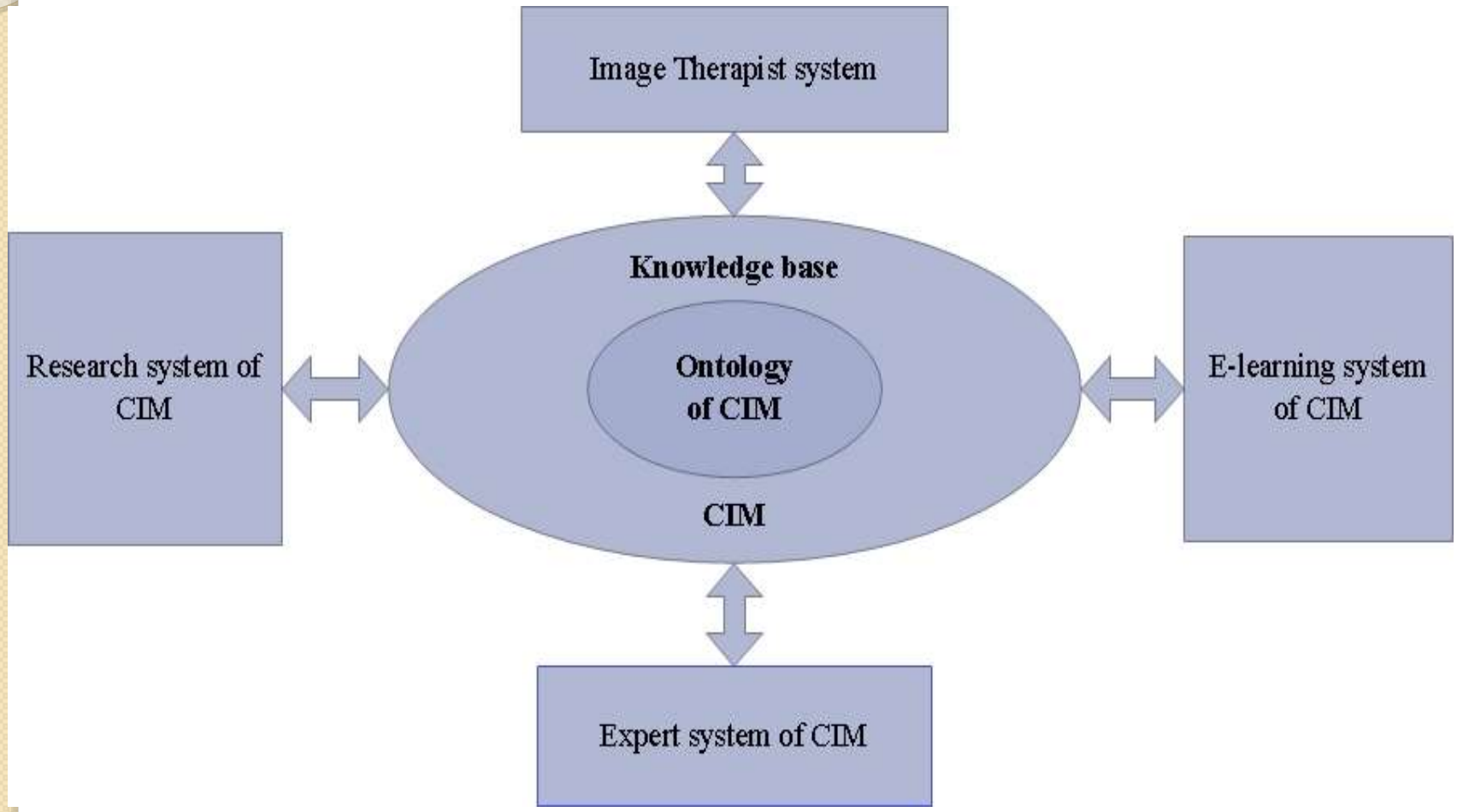
General requirements for information analytical environment

- Information environment should be consistent, compatible with existing onto-based information environments, systems and resources in traditional Chinese medicine and conventional medicine.
- The information background should be developed using control technologies and quality assurance according to international standards.
- Information environment must be available (simple and not expensive), so it should be designed using free open source software.

Interaction of environment of CIM, information systems for TCM and conventional medicine



General architecture of integrated onto-based information analytical environment of Chinese image medicine



Main requirements for Information system of professional healing Image Therapist

1. The structure of the information system should include: 1) CIM therapist's electronic personal office with GUI (graphical user interface); 2) module of diagnostics results generation by means of CIM; 3) module of therapeutic decisions generation (therapeutic records); 4) medical data-base; 5) module of data exchange between CIM therapists (Fig. 4).

2. Image Therapist information system should have access to information systems CIM KB, ES CIM, CIM EIS, and ISR CIM.

Main requirements for Information system of professional healing Image Therapist

3. Module of diagnostics results generation by means of CIM should provide input of personal and medical information about patients including data obtained by means of conventional medicine, such as case history and medical examinations (tests, functional diagnostics results, doctor's conclusion, etc.), and include diagnostic information obtained by TCM and CIM methods, such as palpation diagnostics, energy diagnostics with hand and (or) body, internal image diagnostics ('eye of mind', 'second heart'), and self-assessment information (physical and psychological state) of a patient before and after treatment (Table 1).

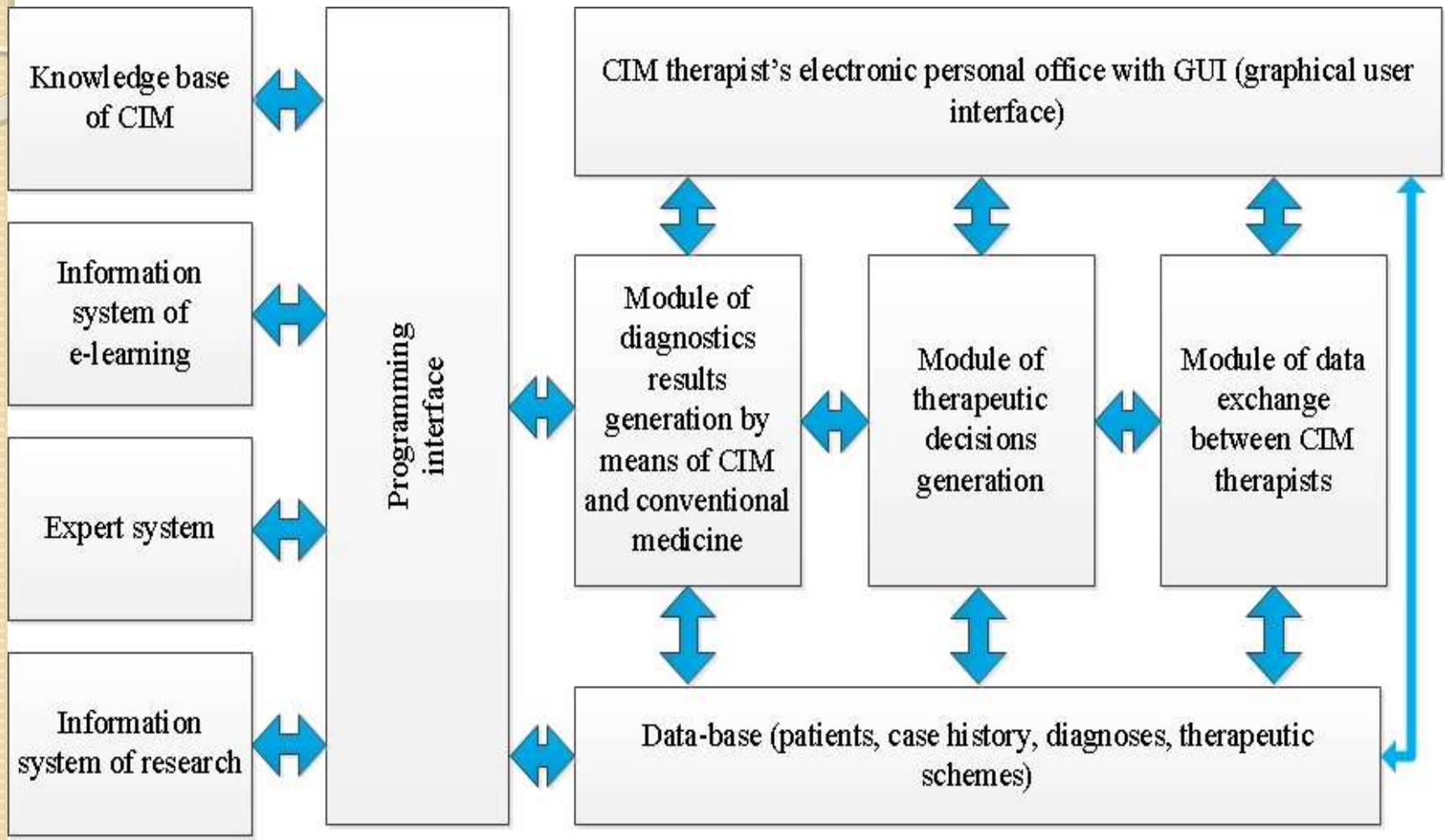
Main requirements for Information system of professional healing Image Therapist

4. Medical data-base in addition to the traditional personal information about patients and their health data obtained by conventional medicine methods (case history, tests, functional diagnostics results, etc.) contains visual data (image) diagnostic information of a CIM therapist, and therapeutic schemes used by an image therapist when healing a patient. The elements of medical data-base should be used as specific examples of CIM ontology classes as a compound of the CIM onto-based knowledge-base.

Types of diagnostic information in the Image-therapist system

Personal information (age, sex, family members, etc.)	**Medical information about a patient includes data obtained by means of conventional (Western) medicine, such as case history and medical examinations (tests, functional diagnostics results, doctor's conclusion, etc.)**
Self-assessment information (physical and psychological state) about a patient before and after therapy by means of psychologic testing	Diagnostic information obtained by TCM and CIM, such as results of TCM diagnostics methods (examination, auscultation, palpation diagnostics), energy diagnostics with hand and (or) body, internal image diagnostics ('eye of mind', 'second heart')

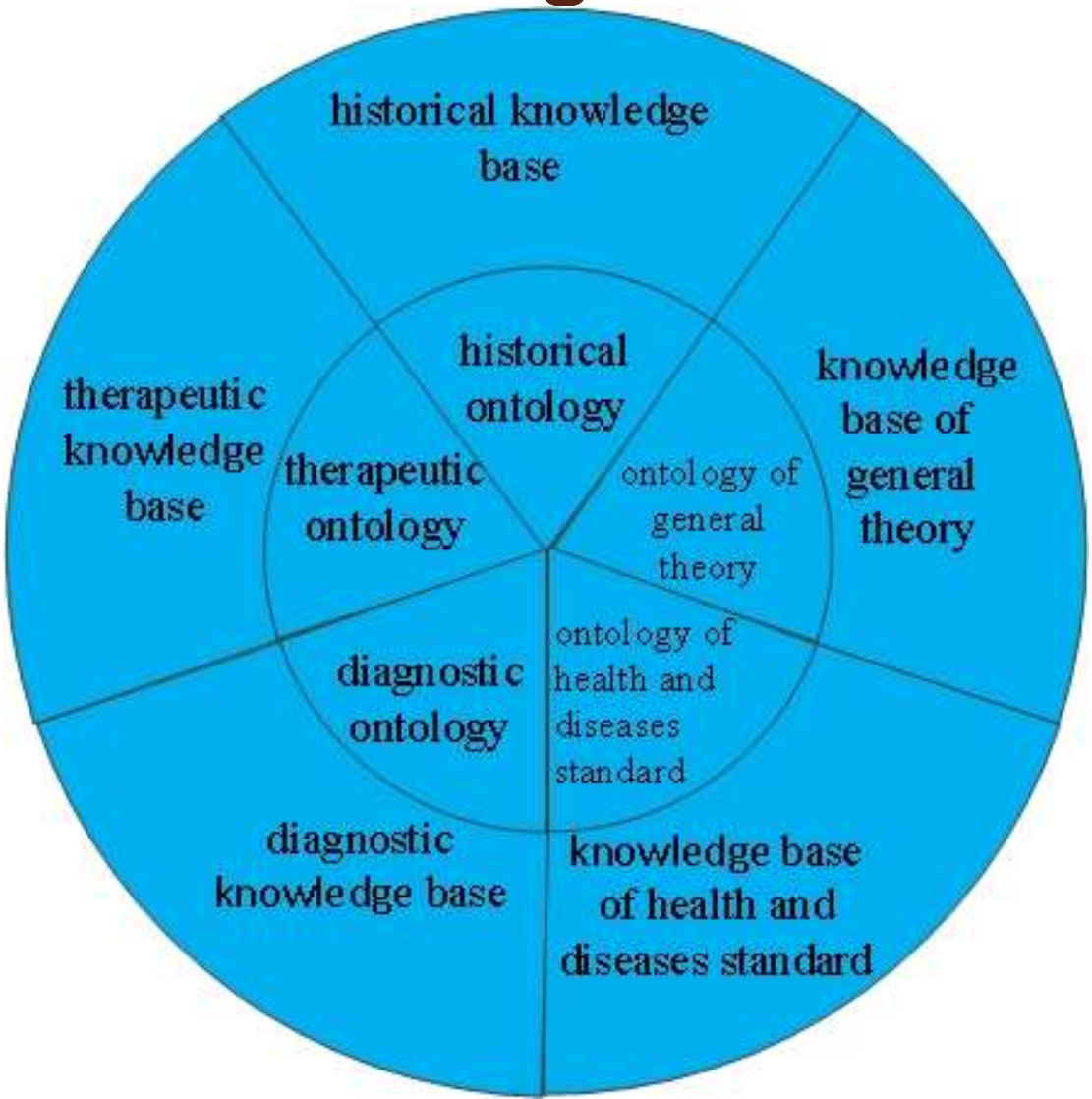
General architecture of information system of professional healing Image Therapist



The main requirements for knowledge-base are

- CIM knowledge-base should contain five main components: 1) historical knowledge-base of CIM; 2) knowledge-base of general theory of CIM; 3) knowledge-base of health and diseases standards in CIM; 4) diagnostic knowledge-base of CIM; 5) therapeutic knowledge-base of CIM.
- The structure of diagnostic knowledge-base should include CIM verbal conceptual knowledge of CIM and specialized knowledge-base "Atlas of images" of visual (image) information of CIM.
- CIM knowledge-base should be based on ontology of CIM domain.
- CIM knowledge-base should be consistent with TCM and conventional medicine knowledge-bases that makes possible comprehensive comparative analysis of different conceptual models of disease and treatment methods in CIM, TCM and conventional medicine.

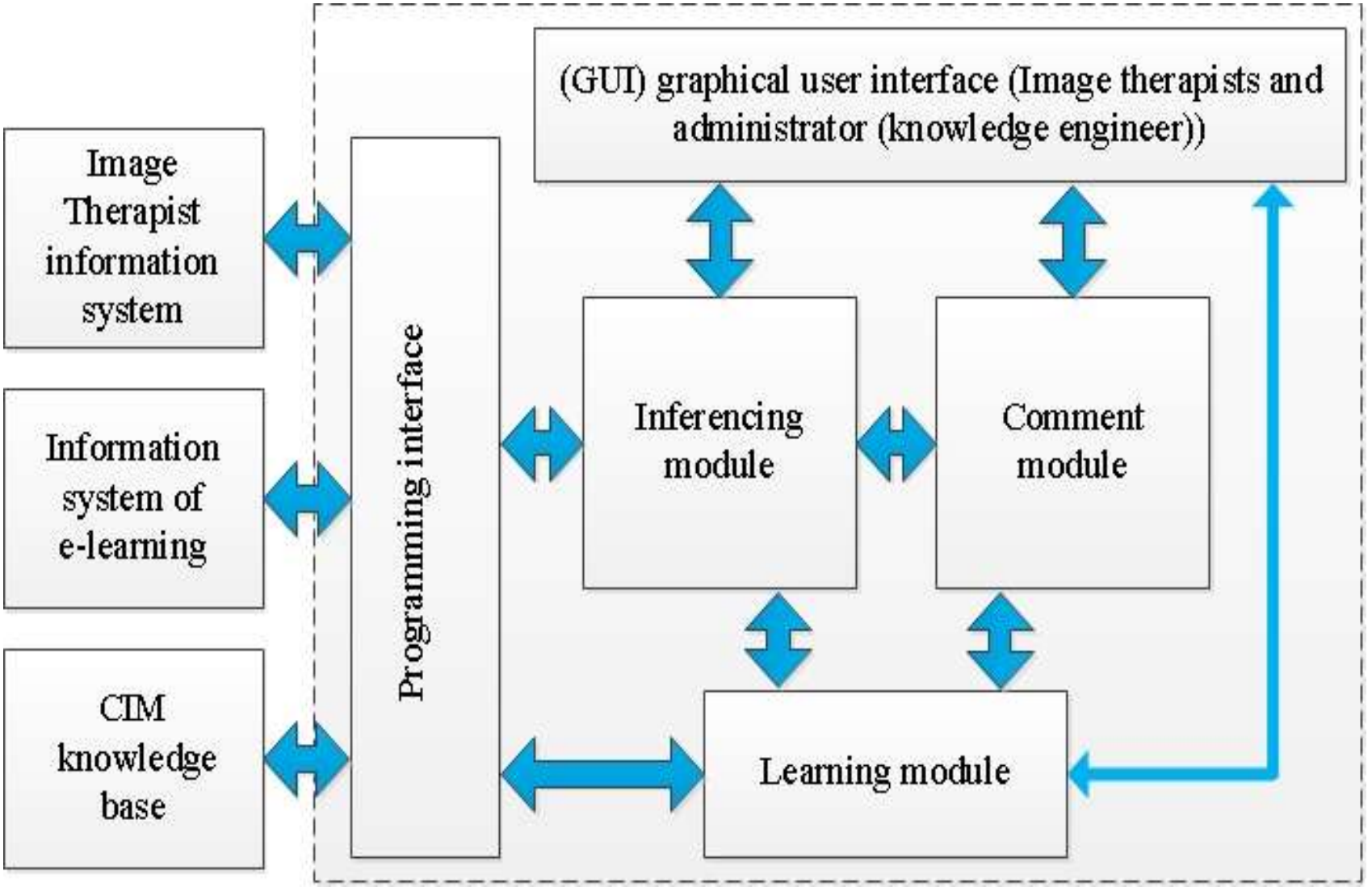
General image of structural components of ontology and onto-based knowledge-base of CIM



The main requirements for the expert system for diagnostic and therapeutic decision-making support in CIM

- The expert system should include: 1) graphical user (CIM therapist) interface and administrator (knowledge engineer); 2) inferencing (diagnostic and therapeutic) module; 3) comment and justification module; 4) learning module.
- Expert system should have access to information systems ISPH Image Therapist, CIM KB, ES CIM, CIM EIS, and ISR CIM.

General architecture of the expert system for diagnostic and therapeutic decision-making support in CIM



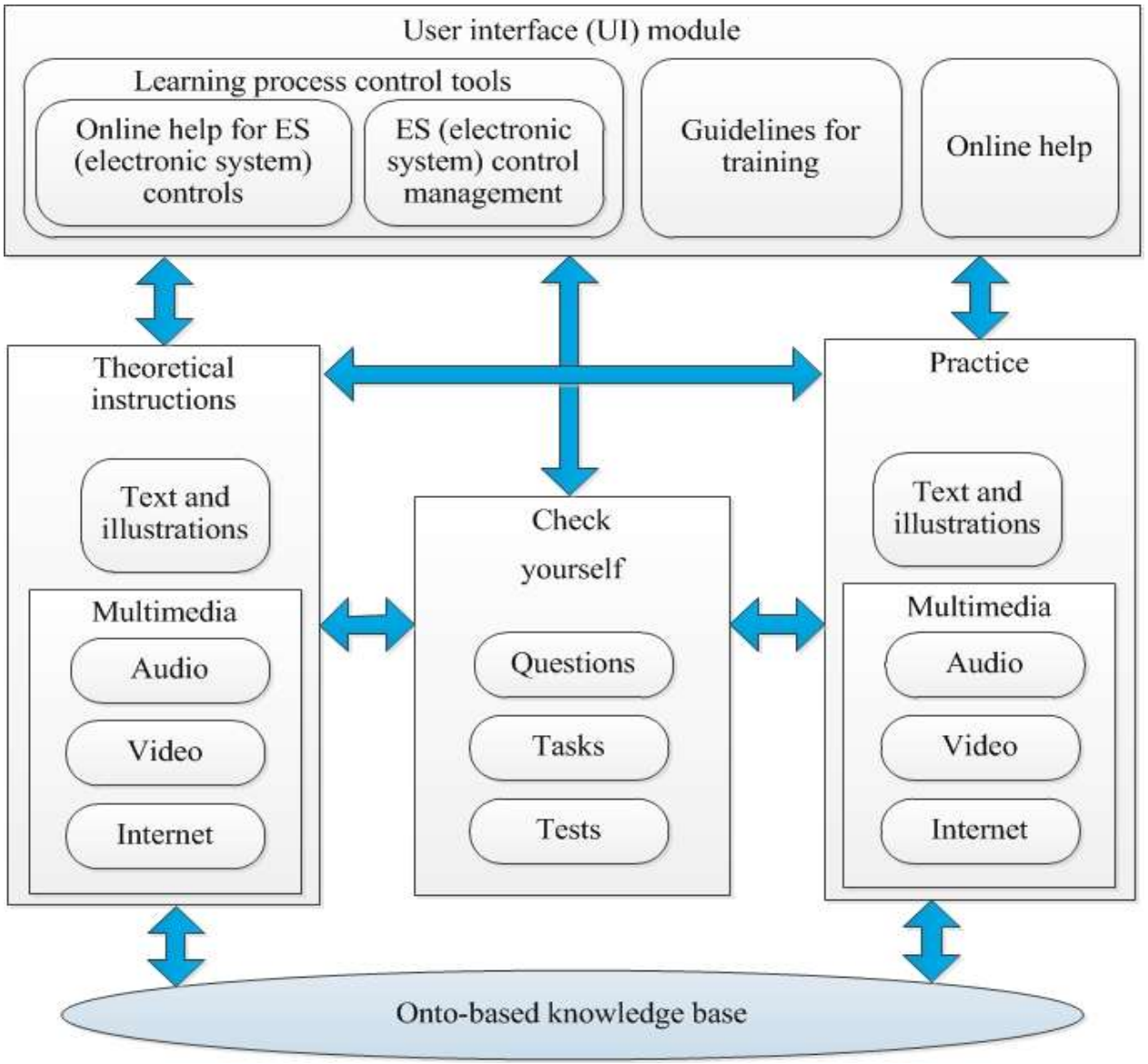
The main requirements for CIM e-learning system

- The CIM e-learning system should include: 1) graphical user interface; 2) module of learning control; 3) online help; 4) module of theoretical instructions; 5) practice module; 6) module of knowledge and skills control (tests).
- CIM e-learning system should have access to information systems ISPH Image Therapist, CIM KB, ES CIM, CIM EIS, and ISR CIM.
- CIM e-learning system should harmoniously combine text and image resources and multimedia technology.

The main requirements for CIM e-learning system

- CIM e-learning system should be adaptable to the needs and individualities of a specific user (student).
- CIM e-learning system should be implemented in the form of interconnected multimedia electronic textbooks and units for awareness testing.

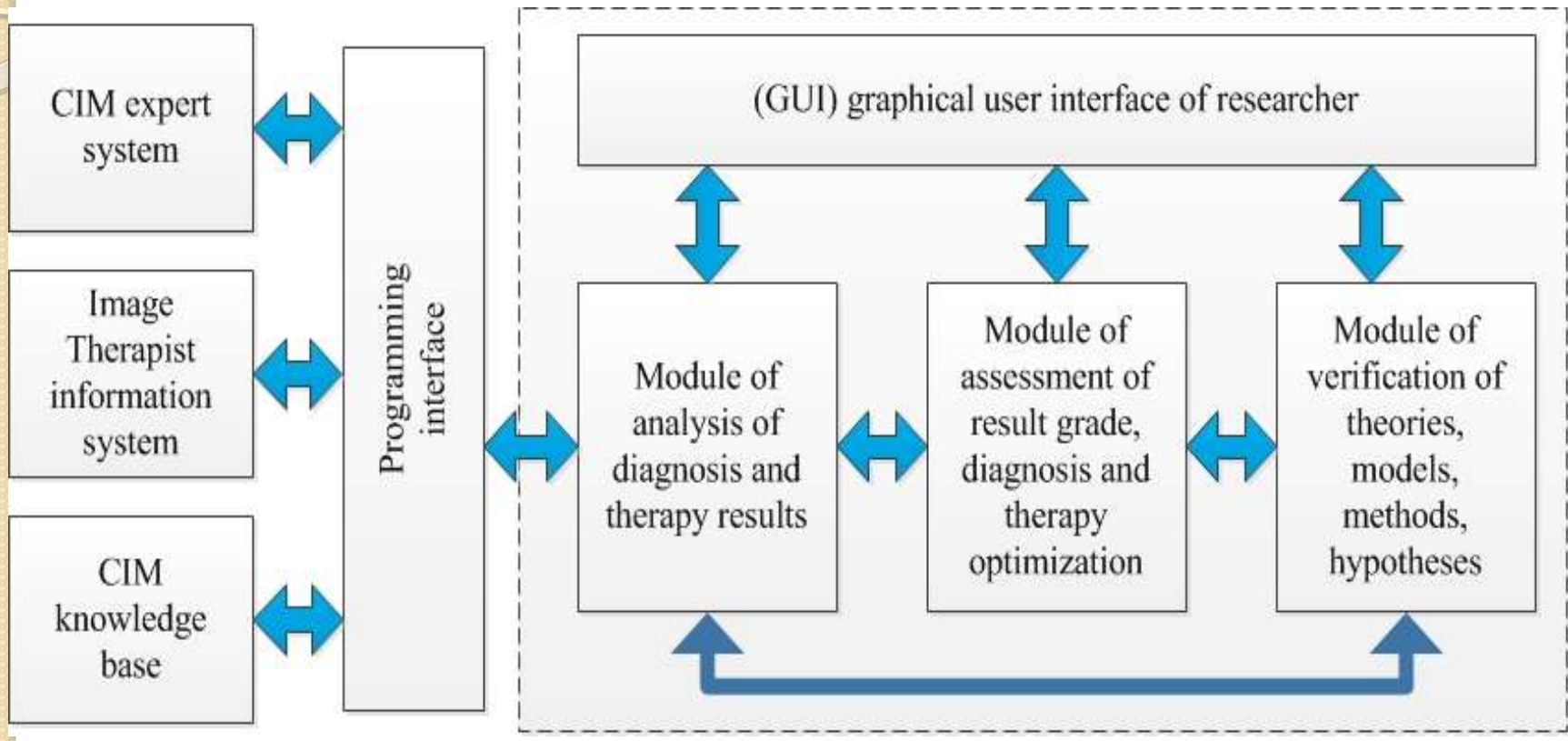
General architecture of the e-learning information system for CIM therapists



The main requirements for information system for CIM research

- The structure of the information system of CIM research should include: 1) graphical user interface (researcher, scientist) 2) module of results analysis of diagnosis and treatment by methods of CIM; 3) module of assessment of result grade and optimization of diagnosis and therapy by methods of CIM; 4) module of verification of theories, models, methods and hypotheses in the scientific direction of CIM.
- Information system of CIM research should have access to information systems ISPH Image Therapist, CIM KB, and ES CIM.

General architecture of the information system for CIM research



Conclusions

- The timeliness of the development of integrated onto-based information analytical environment of scientific research, professional healing and e-learning of Chinese image medicine is substantiated that would enable organisation and coordination of researchers and practicing CIM therapists activities on a high scientific, technological and infrastructure levels; data collection and automated statistical and intellectualized analysis of treatment results by means of CIM; creation of a unified database of theoretical, experimental and clinical research in CIM that will facilitate the implementation of the program [13] of research on a high scientific level.
- The basic tasks of the development are substantiated and general architecture of the integrated onto-based information analytical environment of scientific research, professional healing and e-learning of Chinese image medicine is developed.
- The requirements are defined and the general architecture of components of integrated onto-based information analytical environment of scientific research, professional healing and e-learning of Chinese image medicine is developed.

The main tasks that need further solution

- To create software of the developed integrated information analytical environment such as required models (analytical, simulation), methods and algorithms for operation of this integrated environment and its component information systems.
- Due to the reasonable software specificity to perform simulation, analysis and optimization of structural (architectural) and functional features of the developed integrated onto-based information analytical environment, and to create a detailed (verified) project of integrated onto-based information analytical environment and its components.
- To substantiate the choice of information technology and software environment for implementation (coding, programming) of the project of integrated onto-based information analytical environment and its components.

The main tasks that need further solution

- To implement the project of integrated onto-based information analytical environment in the form of software.
- To conduct testing, verification and validation of integrated onto-based information analytical environment.
- To install and train users to work with the developed integrated onto-based information analytical environment.
- To test and evaluate the operational quality of the developed onto-based information analytical environment of scientific research, professional healing and e-learning of CIM.

References

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