BASIC CLASSIFICATION MODEL OF TELEMEDICINE STATION

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Telemedicine network and telemedicine station construction is an actual and relevant scientific problem nowadays. The issue of telemedicine network construction is well researched. So, in [1-4] the basic components of telemedicine service, the principles of their implementation and provision to patients, medical experts and other users are studied. In [5-8], the general issues regarding the telemedicine networks construction and design are investigated, and some practical recommendations for their implementation are provided. Nevertheless, it's important to emphasize that research in the field of telemedicine is not systematic in nature - the considerable attention is given to some distinct issues and problems only, while the others, on contrary, are less worked out. All this led to the fact that the unified approaches and systematic solutions while developing and creating the technical documentation of telemedicine network construction and design as well as of telemedicine stations practically doesn't exist today. Current telemedicine networks and telemedicine stations mostly were created separately, without generic coordination and planning of further integration with the other similar networks or stand-alone stations. As a result, a large part of the implemented projects are incompatible with each other, which in turn slows down the development of nationwide telemedicine networks significantly.

The purpose of this work is the development of detailed model of telemedicine station classification considered to be a basement of typical, unified technical and design solutions in the field of telemedicine stations constructing.

Classification features and criteria were selected as a result of systematization and generalization of the accumulated practical experience of telemedicine station implementation in various countries, as well as harmonization with international and national legal acts and regulations. It's obvious that in this case different classes will share some join features (e.g. functional characteristics) as well as multiple classifications could be assigned to a station. For each specific class, information will be presented as an intersection of these features, which aren't mutually exclusive, while their values are clearly defined, mutually exclusive, and collectively exhaustive. With that said the use of faceted classification technique [9] is appropriate to create a classification model of telemedicine stations.

The faceted technique means that classification system is captured from a variety of independent subsets - facets (classification features and criteria). Each facet Φ_i contains a number of values taken by this feature or criteria. These values are mutually excluded. In general the classification system can be described by the following faceted formula $ClS = (\Phi_1, \Phi_2, ..., \Phi_n)$.

Let's consider some set of telemedicine stations - *PT*, over which the set of stations' features - U_{PT} - is defined:

$$U_{PT} = \{u_{PTi} \mid i = 1,...k\}, \tag{1}$$

where u_{PTi} stand for the elements of U_{PT} set.

Then the facetted set *ClS* over the *U* set can be defined as following:

$$ClS(U) = \{ClS_k \mid k = 1,...t\}, \tag{2}$$

where ClS_k denotes the facet, which defines the k^{th} classification feature of the telemedicine station.

Each facet can take the defined set of possible values:

$$\phi^{ClS_k} = \{\phi_{k1},...\phi_{km}\}, \tag{3}$$

where *m* denotes the number of possible values of i^{th} facet.

Each element of *PT* set should contain at least one value of the faceted feature:

$$\phi_j(u_{PTi}) = \left\{\phi_{ks}(u_{PTp}),\ p \in \{1,...k\}\right\} \subset \phi^{ClS_k}, \tag{4}$$

The set containing all the facetted features can be defined as following:

$$\phi_j(u_{PTi}) = \left\{\phi_{ks}(u_{PTp}), \forall p : p \in \{1,...k\}, \phi_j(u_{PTi}) \neq \varnothing\right\}, \tag{5}$$

The overall faceted formula *Ff* to classify the telemedicine station is following:

$$Ff\ (u_{PTi}) = \left\{[ClS_j : \phi_j(u_{PTi})] \,|\, ClS_j \in ClS(U), \phi_j(u_{PTi}) \in \phi^{FS_k} \forall j \in \{1,...,k\}, \phi_j(u_{PTi}) \neq \varnothing\right\}, \tag{6}$$

Let's use this approach to classify telemedicine stations by features captured through the practical experience of their implementation (Table 1).

Table 1 – Basic classification model of telemedicine station

Facet (feature/criteria)	**Faceted value**
Type of communication with (connection to) the telemedicine network	Wired connection
	Wireless connection
Degree of mobility	Stationary
	Portable
	Mobile
Type of provided telemedicine service	Basic (only one type of telemedicine service is provided)
	Diagnostic (several types of diagnostic telemedicine services are provided)
	Universal (any telemedicine services provided)
Type of energy and power supply	"Green" (station is powered using the renewable sources e.g. solar energy)
	Hybrid (power supply designed by the classic scheme, and the backup using the renewable sources)
Distance to the central or regional telemedicine hub	Local
	Outlying
Type of placement	Station of walking accessibility (located in places of mass gathering of people e.g. airports, business centers, etc.)
	Establishment station (located on the territory of some medical institution)
	Separate station (separate institution with all the necessary infrastructure)
Type of construction	Open station

	Cabin
	Cabinet
Subordination level	National
	Oblast/Regional
	Urban
	District
Type of ownership	State
	Municipal
	Private

Given faceted classification model uses a set of semantically cohesive categories that are combined as needed to create a classification of telemedicine stations. In this way, the faceted classification is not limited to already defined facets and can be updated with the new features.

Summary

The proposed model of telemedicine station classification provides an opportunity to determine a class of a telemedicine station quickly, which significantly simplifies the task of telemedicine station designing and shorten the time of creating the technical documentation. Further research should be held to obtain some typical design solutions for the construction of telemedicine stations in the variety of initial data.

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