
**Information technology — Affective
computing user interface (AUI) —**

**Part 1:
Model**

*Technologies de l'information — interface pour la reconnaissance et
la simulation des émotions —*

Partie 1: Modèle

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Published in Switzerland

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives or www.iec.ch/members_experts/refdocs).

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This document was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 35, *User interfaces*.

A list of all parts in the ISO/IEC 30150 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html and www.iec.ch/national-committees.

Introduction

Affective computing individualizes user experience based on user needs and characteristics to achieve better outcomes, including: increased effectiveness, efficiency, satisfaction, and user experience.

It is important to consider affective characteristics of humans in the design and presentation of human-computer interactions. Affective computing builds a harmonious human-computer environment by enabling computing-based systems to recognize, interpret and simulate human affects. Affective applications promise new insights into what people are feeling and can better serve their needs.

Limitations on affective computing include diverse affective characteristics currently used and the way to interpret and reply to these affective characteristics.

A general, standardized and systematic model is needed to facilitate applying affective computing within human-computer interaction regarding usability and accessibility.

This document presents a systematically defined model for affective computing user interfaces (AUI) and topics for AUI standardization. This can be important to establish the core and foundation of AUI and their applications.

This document is intended to be utilized as a reference (for guidance) for developers of systems that want to meet the needs of diverse users.

Future parts of the ISO/IEC 30150 series will provide additional guidance on implementation of AUI.

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Information technology — Affective computing user interface (AUI) —

Part 1: Model

1 Scope

This document establishes a model for affective computing user interfaces (AUI). [Annex B](#) also suggests topics for AUI standardization.

This document does not specify the implementation of affective computing.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1 affective computing user interface AUI

user interface that includes the use of *affective characteristics* (3.3) to meet users' affective needs

Note 1 to entry: AUI can be implemented in software or hardware.

3.2 affective computing

collection, recognition, strategy and presentation of *affective characteristics* (3.3) of human-computer interactions

3.3 affective characteristic

particular type of affect that is believed to be useful

3.4 affect representation

general and computable model that can be used for *affective characteristic recognition* (3.6) and presentation within a computing-based system

3.5 dimensional affective space

combination of several *affective characteristics* (3.3) that can be represented as a set of dimensions

Note 1 to entry: Each affective characteristic can have a range of values (e.g. from strongly positive to strongly negative, or between two alternatives) that can form the basis of dimension in affective dimensional space.

3.6 affective characteristic recognition
process of identifying *affective characteristics* (3.3)

3.7 affective characteristic classification
process of classifying *affective characteristics* (3.3) into categories

3.8 context of use
combination of users, goals and tasks, resources and environment

Note 1 to entry: The “environment” in a context of use includes the technical, physical, social, cultural and organizational environments.

Note 2 to entry: The “users” in affective computing are represented in user profiles.

Note 3 to entry: The “resources” relevant to affective computing include collection devices, for example, cameras and microphones.

[SOURCE: ISO 9241-11:2018, 3.1.15, modified — Notes 2 and 3 to entry were added.]

4 Model

4.1 Affective characteristics

There are a range of affective characteristics (including culture and emotions) that determine a user's behaviours and needs when interacting with an information and communications technology (ICT) system. This document provides a model that works with all types of affective characteristics, without defining specific characteristics.

4.2 General model

Affective computing user interface (AUI) is a user interface that interacts with user's affective needs and characteristics. AUI processing involves affective characteristic data collection, recognition, strategy and presentation. A user adjusts his or her affects according to computing-based system's feedback and initiates further interactions with the system (shown in Figure 1). Affect representation provides a unified description of affects in AUI.

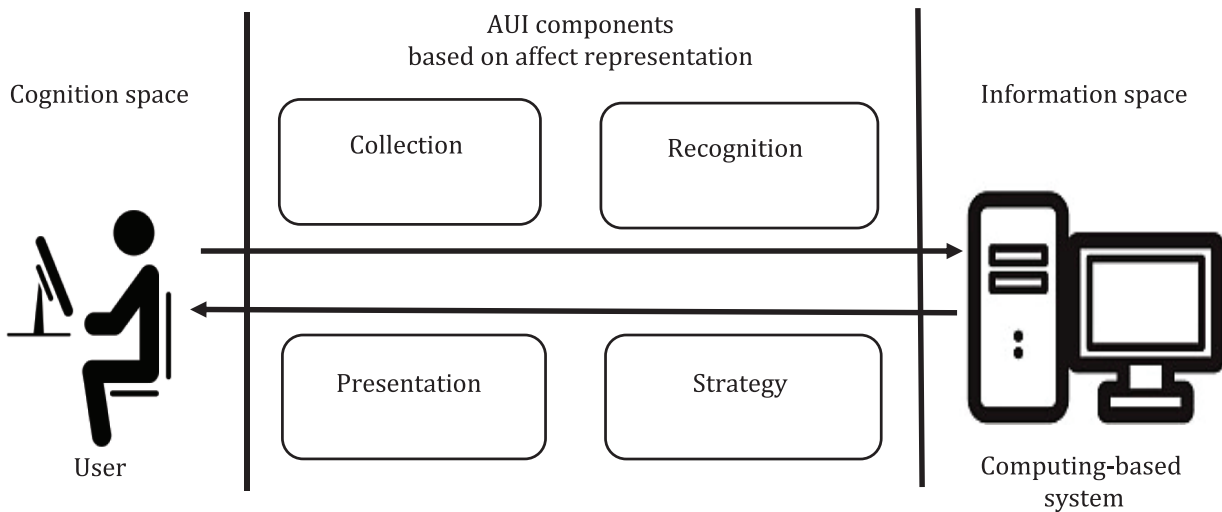


Figure 1 — AUI model

[The following serves as the text alternative for [Figure 1](#)]

The figure consists of three parts: cognition space, AUI components and information space.

The cognition space contains a user. The AUI components include four boxes demonstrating the four components of the process of the AUI model, which stand for collection of affective characteristic data, recognition, strategy and presentation. The information space contains a computing-based system.

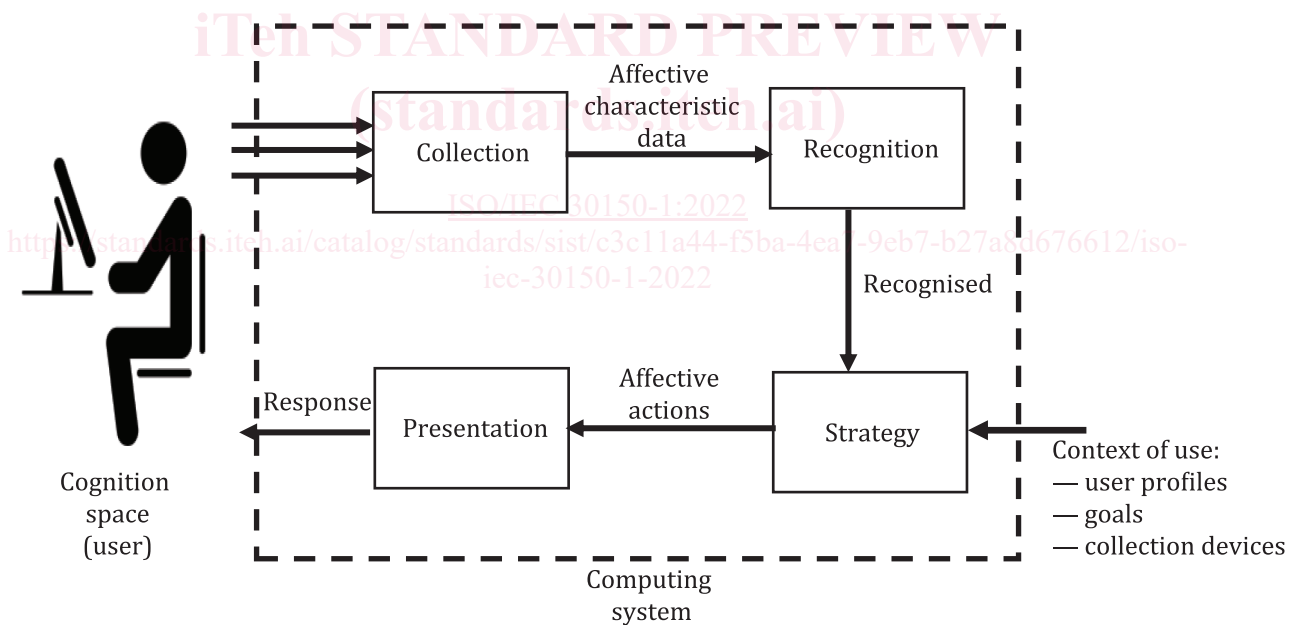
There are interactions between the cognition space and information space passing through the AUI components: one from user points to the computing-based system, indicating the input from user to the system, while the other one from computing-based system points to user, indicating the feedback to user.

Affect representation provides the foundation for the four components of the AUI model.

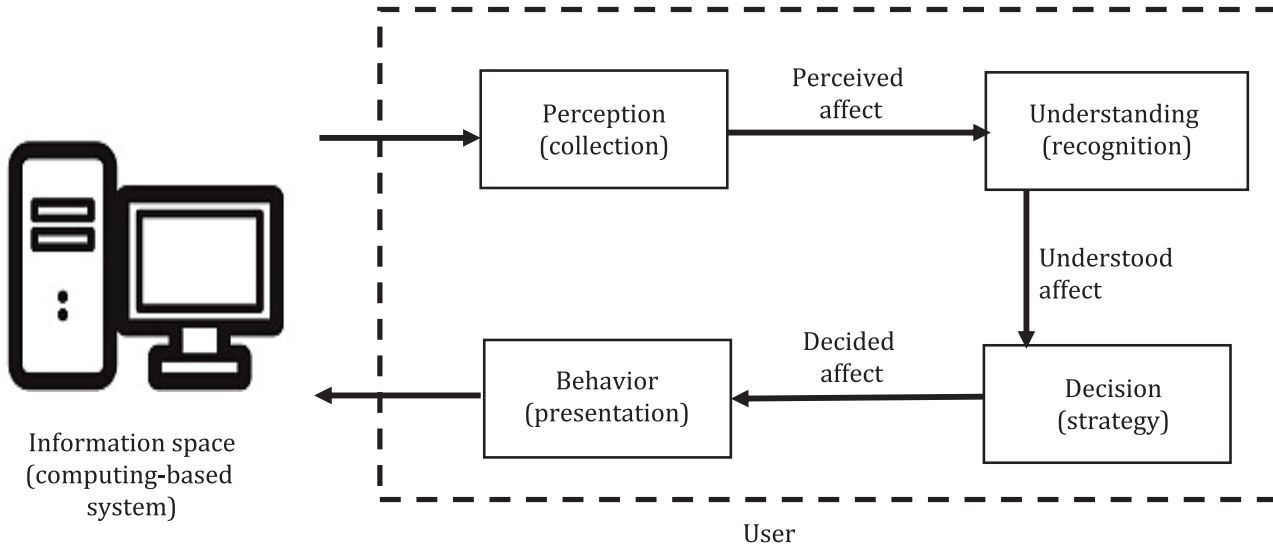
[end of the text alternative for [Figure 1](#)]

4.3 AUI-based interaction model

AUI can support interactions that implement affective computing. [Figure 2](#) provides a model of human-computer interaction using AUI involving two loops. Loop 1 is the user seen from the side of computing-based system and loop 2 is computing-based system seen from the user side. [Annex A](#) provides an example of an AUI application.



a) Loop 1: User seen from the side of computing-based system



b) Loop 2: Computing-based system seen from user side

Figure 2 — AUI-based interactions

[The following serves as the text alternative for [Figure 2](#)]

- a) Loop 1: "User seen from the side of computing-based system" is illustrated in [Figure 2a](#)). It shows how human affects are seen and processed within information space. There is multi-type information from a user, such as speech, facial expression and gesture. The computing-based system first uses a collection component to gather affective characteristic data from a user. Then a recognition component identifies human affects, and a strategy component, which combines result of the recognition with externally provided context of use information and generates affective actions to be executed in the presentation component.
- b) Loop 2: "Computing-based system seen from user side" is illustrated in [Figure 2b](#)).

It shows how the output of computing-based system is seen from user side. In cognition space, user processes the output of the system to perceive and understand affect. Then user decides the affect to perform behaviour as feedback to the computing-based system in order to initiate a new turn of AUI interactions. The process of perception, understanding, decision and behaviour correspond to the components of collection, recognition, strategy and presentation in loop 1, respectively.

[end of the text alternative for [Figure 2](#)]

NOTE 1 [Annex A](#) provides an application example of AUI-based interaction model.

NOTE 2 [Annex B](#) identifies possible standardization topics to implement this model.

4.4 Affect representation

4.4.1 General

Affects can be described via affect representation, which contains affective characteristic categories and dimensional affective space.

4.4.2 Affective characteristic categories

Categories of affective characteristics can be developed from any individual affective characteristic or combination of affective characteristics.

Different combinations of affective characteristics result in different user behaviours and needs.

4.4.3 Dimensional affective space

Dimensional affective space can be used to represent affective characteristics dimensionally.

NOTE 1 Different combinations of affective dimensions correspond to different dimensional affective spaces.

Recognized affect can be represented by a set of numeric (or ordinal) values, which indicate its location in the dimensional affective space.

NOTE 2 Represented recognized affect is sometimes referred to as an affective state.

4.5 Affective characteristic data

4.5.1 General

Affective characteristic data refers to data that is captured from users and is involved in affective computing.

4.5.2 Data type

Affective characteristic data can be static data or dynamic data.

EXAMPLE

- a) Static data can record user's affective characteristics at a certain moment, such as an image.
- b) Dynamic data can record user's continuous behaviours in a period, such as a video or a voice clip. Dynamic data stream reflects dynamic variance of affective characteristics.

4.5.3 Modalities and media

Modalities of affective characteristic data can be various, according to the interactions between users and AUI. Major modalities include visual, auditory, tactile and physiological signals. For each modality, diverse types of media can be used. Affective characteristic data can be of one or more than one modality. The modality-specific information and descriptions of media types are shown in [Table 1](#) and [Table 2](#), respectively.

Table 1 — Modalities and media types of input

Modality-specific information	
Modalities	{ALL} or one or more of {Visual, Auditory, Tactile, Neurophysiological}