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SYSTEMS REFERENCE DELIVERABLE

Ethical considerations of artificial intelligence (AI) when applied in the active assisted living (AAL) context

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ETHICAL CONSIDERATIONS OF ARTIFICIAL INTELLIGENCE (AI) WHEN APPLIED IN THE ACTIVE ASSISTED LIVING (AAL) CONTEXT

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The text of this Systems Reference Deliverable is based on the following documents:

Draft	Report on voting
SyCAAL/301/DTS	SyCAAL/319/RVDTS

Full information on the voting for the approval of its can be found in the report on voting indicated in the above table.

The language used for the development of this Systems Reference Deliverable is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

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- reconfirmed,
- withdrawn, or
- revised.

INTRODUCTION

This document deals with the ethical implications and moral questions that arise from the development and implementation of artificial intelligence (AI) technologies applied in the active assisted living (AAL) context.

The population in all countries is increasingly ageing. Reducing the burden of long-term care for older persons is a major policy issue in every country. Active assisted living (AAL) systems help older persons with daily living activities so that they can live independently as long as possible. AAL can be a solution to this demographic issue.

AAL may use AI technologies to understand the condition of an AAL care recipient and their environment and provide appropriate services at appropriate times. AI-enabled systems must be aware of the decline of the AAL care recipient's physical/cognitive/judgment abilities as they age, and these systems must act appropriately. For instance, AI can determine a life-threatening risk to the AAL care recipient and a privacy concern regarding obtaining and using personal information.

The three issues around AI in general are as follows: concerns about the algorithms and particularly those that have been created by machine learning technology without human intervention; the extent to which these algorithms result in misidentification and misinformation; and the misuse of personal data leading to consequences and harm to individuals.

It is, therefore, necessary to develop general guidelines for the use of AI applied in the AAL context. This document deals with the ethical implications and moral questions that arise from the development and implementation of AI in AAL.

ETHICAL CONSIDERATIONS OF ARTIFICIAL INTELLIGENCE (AI) WHEN APPLIED IN THE ACTIVE ASSISTED LIVING (AAL) CONTEXT

1 Scope

This document describes ethical considerations that are relevant when developing AAL systems and AAL services.

This document covers AAL-specific issues related to AI that supplement those ethical considerations already addressed in other AI documents. Examples include the WHO and OECD principles of AI and those of the High-Level Expert Group on Artificial Intelligence set up by the European Commission.

This document analyses whether these frameworks for the governance of AI are sufficient to meet the requirements of the AAL environment and in particular to meet the needs of AAL care recipients.

The objective of the ethical assessment is to create concrete and clear ethical guidelines that can be used as checklists in AAL service and system platform design, development and implementation.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC TS 63134:2020, *Active assisted living (AAL) use cases*
IEC TS 63134:2020/AMD1:2022

IEC 63240-1, *Active assisted living (AAL) reference architecture and architecture model – Part 1: Reference architecture*

IEC 63240-2, *Active assisted living (AAL) reference architecture and architecture model – Part 2: Architecture model*

3 Terms, definitions and abbreviated terms

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

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

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

3.1 Terms and definitions

3.1.1
ethics
moral principles that govern an actor's (person or technical system) behaviour or their conduct of an activity

3.1.2
artificial intelligence
AI
branch of computer science devoted to developing data processing systems that perform functions normally associated with human intelligence, such as reasoning and learning

[SOURCE: IEC 60050-171:2019, 171-09-16, modified – The domain "<discipline>" has been omitted.]

3.1.3
AAL service
active assisted living service
action or function of an AAL system creating an added value for customers

EXAMPLE 1 Configuration and maintenance of AAL systems.

EXAMPLE 2 Assistant systems to support the home environment.

[SOURCE: IEC 60050-871:2018, 871-01-04, modified – The note to entry has been deleted.]

3.1.4
AAL user
active assisted living user
person who uses or benefits from, or uses and benefits from, AAL devices, systems or services

[SOURCE: IEC 60050-871:2018, 871-02-05]

3.1.5
AAL care recipient
person who receives and consumes AAL care services

3.2 Abbreviated terms

The abbreviated terms are given in Table 1.

Table 1 – Abbreviated terms

Abbreviated term	Full term
EU	European Union
IEEE	Institute of Electrical and Electronics Engineers
OECD	Organization for Economic Cooperation and Development
WHO	World Health Organization

4 Ethical considerations relevant to the AAL context

Many national organizations and international consortia have investigated and published proposed sets of requirements or criteria (for example the EU paper on Trustworthy AI [1][1], IEEE paper on Ethically Aligned Design [2], OECD Principles [3], WHO Guidance [4] and ISO/IEC TR 24368 [5]) for the creation of AI enabled and autonomous systems encompassing capabilities such as natural language processing, machine vision, machine learning, artificial neural networks, and their related algorithm development.

[1] Numbers in square brackets refer to the Bibliography.

These requirements are proposed with the goal of enabling these systems to be "trustworthy" (EU [1] and OECD [3] use this terminology) and acceptable for use by a broader society.

A common set of requirements emphasized in these activities, based both on the abovementioned sources and including requirements of this document as well, is summarized in Table 2.

Table 2 – Key requirements for trustworthy AI

Category	Requirement	Description
Lawful AI	International and national laws and human rights can apply	
Ethical AI	Ethics are moral principles that govern an actor's (person or technical system) behaviour or the conduct of an activity	
	Human agency and autonomy	Individuals have the right to decide how and for what purpose(s) they are using the technology.
	Human dignity	Individuals shall be respected, and technical solutions shall not violate their dignity as human beings and, as importantly, allow vulnerable groups to participate in society. Moreover, humans should be aware that they are interacting with an AI system and must be informed of the system's capabilities and limitations.
	Diversity, non-discrimination, and fairness	Unfair bias must be avoided, as it could have multiple negative implications, from the marginalization of vulnerable groups such as the ageing population and the disabled, to the exacerbation of prejudice and discrimination.
	Privacy and data governance	Individuals shall be able to control access to their personal information and the use of the information by the AI system and system developers and operators.
	Individual and societal well-being	AI systems should adopt increased individual human and societal well-being as a primary success criterion, benefiting all human beings, including future generations. It should be ensured they are sustainable and environmentally friendly.

Category	Requirement	Description
Technical dependability and robustness	AI systems should be technically dependable and reliable in their operation, secure from cybernetic and access controls perspectives, and do not pose unreasonable safety risk to an AAL care recipient's physical or mental health.	
	Reliability, safety and security	AI systems should be safe and secure throughout their entire lifecycle in conditions of normal use, foreseeable misuse, or abnormal conditions
	Human oversight and control	AI and autonomous systems should be subject to human oversight and control at a system level and certain important decisions should remain subject to human review and approval/denial.
	Transparency	The basis of a particular AI system decision (the data, algorithms and business model) should always be discoverable and transparent. Furthermore, AI systems shall be created and operated with the ability to provide an unambiguous rationale for all decisions made and accountability for their outcomes. Moreover, AI systems and their decisions should be explained in a manner adapted to the stakeholder concerned, including an AAL care recipient.
	Accountability	If something goes wrong with an AI or autonomous technology, there should be accountability. Appropriate mechanisms should be available for redress for individuals and groups that are adversely affected by decisions based on algorithms. Auditability, which enables the assessment of algorithms, data and design processes plays a key role in accountability.

The discussion of AI and autonomous systems being used in an AAL context that follows in Clause 5 assumes that all AI-enabled AAL systems will be implemented in a lawful manner. The focus, therefore, is on key ethical aspects as they apply to individual AAL care recipients and users (human agency and autonomy, human dignity; diversity, non-discrimination and fairness; privacy and data governance) and specific safety and human oversight concerns as they should be considered during the design and construction of the AI or autonomous system.

5 Ethical issues associated with AAL assistance

5.1 AAL levels of assistance

AAL systems serve AAL care recipients on four categories or "levels of assistance" based on the physical and cognitive condition of the care recipient and their resulting needs:

- Independent (Level 0) – The care recipient is able to live independently with minimal assistance.
- Some assistance (Level 1) – The care recipient is able to live independently with some assistance required periodically.
- Assistance with IADL (Level 2) – Assistance is required with tasks related to instrumental activities of daily living (IADLs).
  - Examples of IADLs include use of transportation, answering the phone, cooking, housekeeping, cleaning, medication management, financial management, etc.