Codebook

State of the Art in AAC: A Systematic Review and Taxonomy

Table of contents

RQ1 - What is the current taxonomy and dominant characteristics of high-tech AAC?

Interaction input

Codes for the interaction input of a high-tech AAC device, if applicable to the research.

(7 codes; multiple could apply)

Verbal: The AAC device requires verbal input from the AC to interact or control the device in some capacity. E.g., Vocal commands.

Camera: The AAC device requires video input from a camera e.g., eye / head movement from the AC to interact or control the device in some capacity. Therefore, the AAC engages in eye tracking.

Tactile: The AAC device requires tactile input from the AC to interact or control the device in some capacity. E.g., Touchscreen.

Gestural: Excluding eye gaze, the AAC device requires gestural input from the AC to interact or control the device in some capacity. E.g., Bodily sensor readings / Brain Computer Interface.

Mechanical: The AAC device requires mechanical input from the AC to interact or control the device in some capacity. E.g., Keyboard, written or pointing device (such as mouse or joystick).

Orientational: The AAC device requires direct orientational input from the AC to interact or control the device in some capacity. E.g., VR orientation to control the AAC.

Contextual: The AAC device requires contextual input from the AC to interact or control the device in some capacity. E.g., Vocabulary changes dependent on location.

Output modality

Codes for the output modality of a high-tech AAC device, if applicable to the research.

(5 codes; multiple could apply)

Audio: The AAC device outputs audio as a modality to communicate with others. E.g., Speech generating device.

Visual: The AAC device outputs visible signals as a modality to communicate with others. E.g., Screen based emojis.

Motion: The AAC devices outputs physical motion signals as a modality to communicate with others. E.g., Vibration as an alert for attention.

Gustation: The AAC device outputs taste signals as a modality to communicate with others. E.g., Bad taste as a cue for distress.

Thermoception: The AAC device outputs thermal signals as a modality to communicate with others. E.g., Heat as a cue for anger.

Scalar attributes

Codes for the scalar attributes of a high-tech AAC device, if applicable to the research.

(8 codes; multiple could apply)

Morphable: Can the AAC be morphable and therefore change physical shape. E.g., AAC software deliberately designed to run on different hardware from tablet to watch / a 3D printed AAC device that morphs to a desirable discreet physical form for the user.

Customisability: Can the AAC be notably customised by the user. E.g., Vocabulary and layout changes.

Automaticity: Can the AAC offer significant automated processes on behalf of the user. Therefore, in specific cases minimal to no user interaction inputs are required for the AAC to operate.

Expressivity: Can the AAC's outputs be significantly customised and adapted by the user. E.g., The user can change the voice of the AAC.

Adaptive: Does the AAC leverage advanced computer technologies. E.g., Machine learning databases and AI continuously learning and adapting to the preferences of the AC.

Practicality: Does the AAC optimise for user discretion, reliance, portability and comfort. E.g., Operating on wearable or interfacing with the user discreetly.

Combined: Does the AAC combine a fusion of input modalities or only offer one independent input modality. E.g., AAC can receive combinations of input from keyboard and eye gaze.

Parallel: Does the AAC interact with multiple input modalities in parallel or only accept a sequential input. E.g., Laptop, earpiece and watch input simultaneously.

Interface layout

Codes for the interface layout of the high-tech AAC device.

(8 codes; multiple could apply)

Symbols: The AAC device uses graphical symbols.

Pictographic / illustration: The AAC device uses pictographic or drawn iconography e.g., cartoon illustrations.

Text / letters: The AAC device uses text as its primary graphics or an on-screen keyboard.

Animation / video: The AAC device uses animation or moving film to enhance the display.

Grid displays: Symbols or text organised in a grid row and column layout. Potentially according to taxonomic or schematic categories.

Visual scene displays: A contextual scene of an event with concepts embedded under hot spots in the scene).

Novel: AAC uses a novel display layout not reflected by the previous codes.

No layout: The AAC does not use a display.

Communication type

What specific type of communication is the high-tech AAC trying to augment, scaffold, enrich or replace.

(2 codes; multiple could apply)

Verbal: The AAC focused upon in the paper is exclusively trying to augment, scaffold, enrich or replace verbal communication upon the behalf of the AAC user.

Nonverbal: The AAC focused upon in the paper is exclusively trying to augment, scaffold, enrich or replace nonverbal communication on behalf of the AAC user. For example, the AAC transmits written e.g., text or visual signals e.g., emojis / body language.

Scenarios and communication partners

What communication partners has the AAC been directly tested with or designed to work with? A study is assumed to be "unclear" if the author does not suggest that the device should be used to communicate with anyone or if we cannot understand what the author meant.

(8 codes; multiple could apply)

Fellow AC: The AAC has been designed or tested to augment and enrich communication from an AC to another person using the same or a different AAC device.

Family or friends: The AAC has been designed or tested to augment and enrich communication between an AC and their personal community i.e., family or friends.

Professionals: The AAC has been designed or tested to augment and enrich the communication of an AC with professional colleagues e.g., AAC to be used with speech and language therapists (SLTs).

Groups: The AAC has been designed or tested to augment and enrich the communication of an AC in group or large diverse settings.

Strangers: The AAC has been designed or tested to augment and enrich communication with strangers and broader communication circles.

Anyone: The AAC has been designed or tested to even augment and enrich non-AAC users' communication.

Virtual: The AAC has been designed or tested to augment and enrich communication within virtual environments and contexts e.g., Video games, social media, entertainment etc.

Unclear: The AAC has been designed or tested yet the author specifies absolutely no scenarios of potential use with communication partners.

Communication model[1]

The authors have deliberately specified the communication model used to design the AAC. Otherwise, judgement is required to determine if the AAC device offers feedback and the speed of feedback.

(3 exclusive codes)

Linear model: The AAC device supports a one-way interaction where feedback is not present. Also known as the sender-receiver model. In this case the AAC cannot provide AC feedback e.g., the AAC design obscures vision with the communication partner.

Interactive model: The AAC device supports a two-way communication stream where feedback is possible but restrained. Consequently, the AC feedback is not natural and simultaneous resulting in slow and indirect feedback i.e., non-natural or delayed.

Transactional model: The AAC device supports a two-way communication stream with immediate feedback. Even simultaneous feedback is possible where the feedback is very direct and fast.

[1] https://newsmoor.com/3-types-of-communication-models-linear-interactive-transactional/

RQ2 - What research methods are used to contribute towards the design and study of high-tech AAC devices and interventions?

User study method

The study methods used by the research.

(10 codes; multiple could apply) – derived from Mack et al (2021).

Controlled experiment: A controlled experiment of the AAC with multiple comparative conditions.

Randomized control trial: A study design that randomly assigns participants into an experimental group or a control group. As the study is conducted, the only expected difference between the control and experimental groups in a randomized controlled trial (RCT) is the outcome variable being studied.

Survey: A survey tool (e.g. questionnaire) was distributed to a relatively broad audience of AAC users or the terms “survey” or “questionnaire” were explicitly used.

Usability testing: Participants were asked to perform a sequence of tasks/use an AAC, with the goal of understanding how usable aspects of the AAC are.

Interviews: The authors explicitly mention the use of interviews, or an interview process compromised a substantial part of the development/testing of the AAC.

Focus groups: The authors stated that they did a focus group – holding a study or discussion with a group of participants who are ACs in the study.

Case study: Applied only if the authors use the term “case study” for the research of AAC.

Field study: Deployment of the AAC and data collection ‘in the wild’ (e.g., not a lab).

Workshop / design: Some form of workshop or design session where researchers and participants work collaboratively together to develop an AAC.

Other: For methods that did not fit into the above categories.

User study location

Identify where a user study of the AAC took place A study is assumed to be “unclear” unless explicitly stated otherwise.

(6 codes; multiple could apply) – derived from Mack et al. (2021).

No user study: Therefore, the code is irrelevant as the AAC is not tested by users.

Near/at researcher’s lab: The AAC was studied at a lab, university or industrial research campus.

Home, residence or school: The AAC was studied at a place the participant visits regularly.

Neutral location: The AAC was studied at a place the participant does not visit regularly that is a neutral location e.g., coffee shop, library, park, conference etc.

Online/remote: The AAC was studied remotely using videoconferencing software, online surveys and over the phone.

Other: The AAC was user studied in an unspecified location or the authors are unclear.

Participatory design

Captured where a study uses participatory or co-design.

(2 exclusive codes) – derived from Mack et al. (2021).

Yes: If the paper used the specific terms “participatory design”, “co-design” or “codesign” to describe the method part of developing the AAC device. Thus, this code does not include papers that may have more loosely used a participatory style of method.

No: Any paper not coded as “yes”.

Contribution type

Based on Wobbrock and Kientz "Research Contributions in HCI"[2].

(6 codes; multiple could apply)

Empirical: New knowledge fostered through findings based on observation and data gathering of AAC. AAC empirical data may be qualitative or quantitative.

Artifact: Driven by the creation and realisation of interactive artifacts – new knowledge is embedded and explored in the AAC artifact and supporting materials that describe it.

Methodological: Methodological contributions create new knowledge that informs how we carry out work on AAC. They influence the methodology of how we develop and design AAC.

Theoretical and opinion: Consist of new or improved AAC concepts, definitions and frameworks. AAC theoretical contributions may be qualitative or quantitative.

Dataset: An AAC dataset contribution provides a new corpus often a shared repository of AAC datasets, algorithms, systems and methods.

Survey: AAC survey research contributions and other meta-analyses review and synthesize previous work done with the goal of exposing trends and gaps.

[2] https://dl.acm.org/doi/pdf/10.1145/2907069

Use of commercial AAC

(2 exclusive codes).

Yes: The paper performs research into high-tech AAC that has been commercially developed by a private corporation prior to the research.

No: If not yes to the previous code.

RQ3 - Who does high-tech AAC devices and interventions focus on?

Community of focus

The accessibility-related population or community being studied or positioned by the authors as benefiting from the research.

(9 codes; multiple codes could apply to one paper) - derived from Mack et al. (2021).

Blind and/or low vision (BVI): people who are blind, low vision, or generally described as having visual impairments. Does not apply to color vision deficiency (CVD).

d/Deaf or hard of hearing (DHH): people with hearing loss or who identify as deaf/Deaf or hard of hearing.

Motor/physical impairment: people with motor or physical impairments.

Autism: people who have autism or autism spectrum disorder (ASD).

Intellectual and developmental disabilities (IDD): congenital disability that impacts how people develop (e.g., Down syndrome).

Other cognitive impairment: this community consists of people with cognitive impairments-- which impact brain function and include things like TBIs but also aphasia and dyslexia; these can be diagnosed at any age and are not necessarily congenital

Older adults: population consists of author-identified older adults. We did not assume that a participant over a certain age was an "older adult", they needed to be identified as an "older adult".

General disability: a paper should be marked as "general disability" if it studied disability or accessibility in general, but no specific subpopulation--for example, looking at what nondisabled people think about disability in general or accessible education for people with disabilities in general (i.e., not a specific group like IDD).

Other: any communities of focus not already listed, such as people with color vision deficiency) or people described by a word that can encompass many disabilities where the participants' disabilities were not further specified (e.g., "special education students", "neurodiverse").

Participant groups

Codes apply for participant groups included in the user studies of the AAC.

(5 codes – multiple could apply) – derived from Mack et al. (2021)

No user study: Therefore, no participants are recruited to study the AAC.

People with disabilities: Participants included people with disabilities.

People without disabilities: Members of the general population, not specifically described as having disabilities. Note if the authors recruited a specific subpopulation other than those categories, record it here.

Specialists: Therapist, doctor, teacher, or anyone who has professional expertise regarding AAC and the community.

Caregivers: any parent, child, guardian, or other person acting as a caregiver to an older adult of someone with a disability.

Use of proxies

Identified the use of *proxies* in papers. We distinguish acting as a stakeholder, where a caregiver, for instance, reports on their own thoughts and opinions as someone who will be affected by a research solution, versus acting as a proxy, where a nondisabled individual speaks to the thoughts, preferences, or behaviours of a person with a disability

(2 exclusive codes). – derived from Mack et al (2021)

Yes

No

Ability-based comparison

Captured if a paper explicitly *compared* the data or performance of people with and without AAC / disabilities in the same circumstances.

(2 exclusive codes) – derived from Mack et al. (2021)

Yes

No