# SIGHInt: Special Interest Group for Human-Computer Integration

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## ABSTRACT

Human-Computer Integration (HInt) is a growing paradigm within HCI which seeks to understand how humans can, and already are, merging with computational machines. HInt's recent inception and evolution has seen much discussion in a variety of symposiums, workshops, and publications for HCI. This has enabled a democratized and decentralised emergence of its core concepts. While this has allowed for rapid growth in our understanding of HInt, there is some discrepancy in how the proponents of this movement might describe its principles, motivations, definitions, and ultimate goals, with many offshoot concepts of HInt beginning to emerge. SIGHint aims to provide a platform to facilitate high level discussion and collation of information between researchers and designers seeking to learn from and contribute to the development of Human-Computer Integration. It is our intention that through this SIG we may better understand how new and emerging, diverging ideas, and perspectives within Human-Computer Integration relate to each other, ultimately facilitating a mapping of the paradigm and a synthesis of its concepts.


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## CCS CONCEPTS

• **Human-centered Computing**; • **Human-computer interaction (HCI)**; • **Interaction paradigms**;

## KEYWORDS

human-computer integration, cybernetics, wearables, augmentation, intelligent agents, ubiquitous computing

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## 1 BACKGROUND

Gruden and Farooq introducted the HCI community to the concept of "Human-Computer Integration" (HInt) with their 2016[4] and 2017[6] papers. Framed as a new paradigm for HCI, HInt purports a conceptual continuum extending the current "stimulus-response" paradigm of interaction toward a "symbiotic partnership" between humans and computers [4], in which both parties are integrated and must be considered holistically. In the following year, a panel titled 'Integration versus Powerful Tools', opened the concept up for debate amongst the wider HCI audience at the 2017 ACM Conference on Human Factors in Computing Systems (CHI) [5]. Through this debate, panelist Shneiderman argued for increasing automation

with more human control; while panelists Maes and Ren argued the necessity and inevitability of agential synergy between humans and computers, both functionally and existentially. This ultimately lead to the organisation of a 2018 Dagstuhl symposium, in which 29 leading experts from industry and academia came together over a five-day workshop to develop and discuss the future of HInt [10].

With significant progress made in the development of the theory in the wake of the workshop, an overarching work titled "Next Steps in Human-Computer Integration" was drafted in 2019 and presented at 2020 CHI [9]. The work, articulating a synthesis of contributions made toward Human-Computer Integration, summarised the current state of the burgeoning paradigm, illustrated in Figure 1. The paper defined HInt as "a new paradigm with the key property that computers become closely integrated with the user", and further broke this into two sub-types of integration. These were *symbiosis*, referring to "systems in which humans and digital technology work together, either towards a shared goal or towards complementary goals" ; and *fusion*, as "integration in which devices extend the experienced human body or in which the human body extends devices".

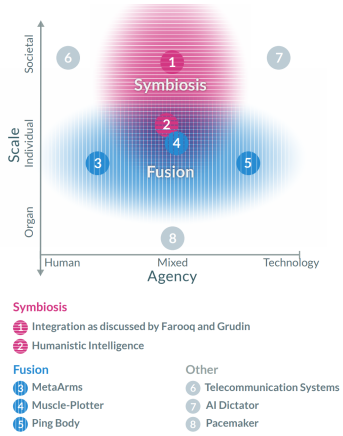


**Figure 1: Previous consensus of the map of Human-Computer Integration. Figure from "Next Steps in Human-Computer Integration," by F. Mueller, et al., 2020, Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems, pp. 1-15.**

Since the writing of "Next steps in Human-Computer Integration", many new researchers have joined the rolling snowball which is HInt. Many new contributions have been made to HInt, growing the field in a multiplicity of exciting, yet diverting directions, much like a sprouting rhizome. With this growth left unattended by the gestalt of the HInt research collective for two years, we find that the original symbiosis-fusion definition has evolved into at least eight different conceptualizations of integration, with five of these set to be published in the coming year alone. This includes: embodied integration, bodily integration, experiential integration, intertwined integration, integrated exertion, and integrated consciousness; in addition to the original identification of fusion and symbiosis. While this growth and diversification can be seen as a positive thing, we argue the necessity for a reconvening of the HInt research community to tend to this sprouting theoretical rhizome as new ideas begin to overlap. For example, the sub-type of integration concerned with technology integrating with the human body has been articulated in three separate publications as: "fusion", "embodied integration; and "bodily integration". With this considered, we present this special interest group, "SIGHInt", to facilitate the pruning and maintenance necessary for the healthy growth of this paradigm.

## 2 AIMS AND GOALS

SIGHInt aims to:

- Facilitate discussion about what HInt means to researchers coming from different backgrounds with diverse viewpoints
- Debate what topics are core and peripheral to HInt
- Collaboratively come to a consensus about what HInt means and the range of topics it covers
- Create a map of the areas of HInt, which demonstrates the underlying structure of how these topics relate to each other

This process will involve an open discussion with attendees. During the session, we will ask attendees to share their own diverse backgrounds, experiences, and opinions to get a broad picture of what HInt means to the community. All suggestions will be added to the map progressively throughout the session. In the latter part of the SIG, we will collectively re-organise, prune back, and remove any redundancies to produce our main deliverable: a community-produced map of HInt. Figure 2 shows an example of the map we intend to produce through this SIG, illustrating loosely structured emerging concepts in human-computer integration to provoke discussion and continue co-shaping this exciting space in this special interest group.

## 3 ATTENDEES

This SIG is being organised in concurrence with a panel and workshop also focusing on human-computer integration. However, the workshop will be focusing on a sub-type of HInt called 'experiential integration', while this SIG aims to give a generalised overview of HInt while seeking to incorporate new contributions to the theory canon. This makes it appropriate for both experienced HInt researchers who wish to develop the field further, and new-comers looking to get a taste for the field. We anticipate this will make the SIG a more accessible venue for becoming acquainted with HInt to the general CHI audience, particularly given the shorter time span of this SIG in comparison to the workshop, its availability of this SIG to all CHI registered individuals, in comparison to the workshop which requires attendees to submit work. We also differentiate this from the HInt panel, which will also explore broader aspects of HInt, but will not allow the more democratized collaboration of all attendees we expect with this SIG. We hope this SIG provides perspectives beyond the field's leading experts in the panel, to include those of the broader community.

## 4 SIG FORMAT

Attendees will be given a link to a video conference platform on which to attend the SIG. Upon commencement online, the format will be as follows:

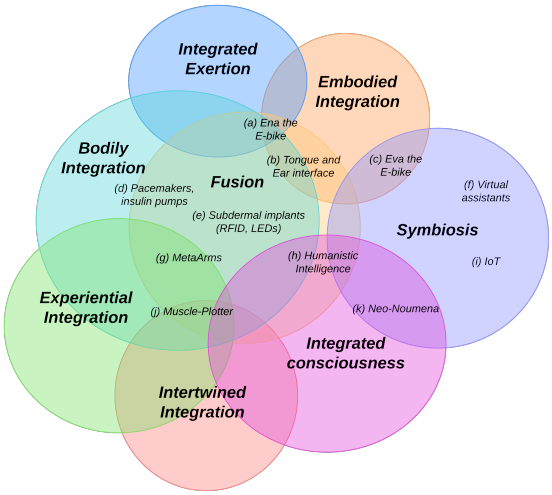


**Figure 2: An example of what our map of human-computer integration might look like at the end of the SIG, with some sub-fields as well as example systems: (a) Ena the E-bike [2], (b) Tongue and Ear interface [11], (c) Eva the E-bike [1], (d) Pacemakers & insulin pumps, (e) Sub-dermal implants (RFID, LEDs), (f) Virtual assistants, (g) MetaArms [12], (h) Humanistic intelligence [8], (i) IoT [3], (j) Muscle-Plotter [7], (k) Neo-Noumena [13]. Please note this is just an example of how we imagine the map might be distributed and we do not intend this to be an authoritative source on the relationships between HInt concepts and associated systems.**

1. Introduction (10 minutes): Organizers will briefly introduce themselves and present a short background of HInt and explain the SIG objectives.

2. Discussion and map drafting (35-40 minutes): Organizers will invite attendees to add to this map. Depending on the platform used, attendees will be able to edit the map themselves, or an organiser will add to the map as suggestions are voiced.

3. Map re-organisation and pruning (15-20 minutes): After a map of HInt is produced, attendees will attempt to organise the map where needed by moving topics around the map, collapsing related topics, removing any redundancies, and so on.

4. Final map adjustments and conclusion (10 minutes): Any further adjustments to the map can be made as the conclusion to this SIG is carried out. Organizers will provide access to a slack group for further discussion.

## 5 OUTCOMES AND NEXT STEPS

The major outcome of this SIG will be a map of HInt developed collaboratively by the attendees, representing diverse perspectives. We hope that this will clarify the diverse topics of HInt, which will benefit not only researchers from the field but also those outside the field hoping to understand it. We also hope the map will be used as a reference tool for researchers to find relevant collaborations in their topics of interest. The final version of this map will be available online.

Following the conclusion of the SIG, organizers will provide a slack group for attendees to facilitate networking opportunities, continue any discussions, and raise further issues or ideas so that organizers can make any final changes to the map.

Moving forward, there will be opportunity for interested attendees to work together with the organizers to produce a journal paper using the content discussed and created, as well as organize future CHI workshops and panels.

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