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## The Power of Imagination

from Keio's Faculty of  
Science and Technology

Human-Agent Interaction and Science Fiction

## Hiroataka Osawa

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# The Potential of Communication Agents

Robot and AI characters that complement society

“Human-agent interaction” (HAI) is a research field that studies and designs interactions between humans and “social agents” such as AI and robots. Agents do not simply provide knowledge and skills. They exist as a part of society, as conversation partners, as entities to discuss and collaborate with in group settings and beyond. Osawa’s work focuses on exploring the potential of robots and AI characters, believing that their nature lies in the way humans feel about and perceive them.

## AgencyGlass: a device conceptualized around anthropomorphism

Human-Agent Interaction (HAI) is a field closely related to that of social robots. Recently, people have been finding more opportunities to come into close contact with robots of different sorts, whether in the form of pets or the kinds that serve you meals at restaurants. When they encounter these robots, humans naturally feel inclined to read their emotions, sense their intentions, and develop attachments to them. HAI is a field broadly studying any interaction between humans and artificial objects that suggests some intrinsic “humanness” or intentionality. This research is rapidly growing in importance, especially as many companies are introducing AI agents that can plan and provide customer support on their own, automate routine tasks, and analyze

data.

Osawa has launched a series of research projects that explore new forms of interaction between humans and human-like agents. One prime example is an agent that was showcased in 2017, conveying emotions and information by capturing the movements of human eyes. Originally, when he was working on giving household appliances human features, Osawa thought, “Maybe by capturing the essence of human interaction and embodying that I can provide psychological support...”

He focused on the eyes, given their ability to convey emotions, and developed a device called “AgencyGlass,” which acts as a substitute for the eyes’ communicative ability (Fig. 1). The camera attachment captures the face and gaze of the person or people in front of it and automatically moves the glasses’ computer-generated eyes accordingly. Thus, when a visually

impaired person wears the device, their eyes appear to move naturally, helping alleviate potential discomfort in social situations. Vibrations are also transmitted to the glasses when the eyes move, allowing the wearer to turn their head accordingly. While they would not be able to see any image, the visually impaired wearer will be able to adjust the direction of their gaze to the object of the conversation, resulting in a smoother interaction.

## Robots that act “catalytically”

One successful example of energizing a reading community is the “Book Introduction Robot,” used at an elementary school in Tsukuba City (Fig. 2). A child first enters the information of a book they want to introduce such as its title and an introduction into a computer. Then, when someone clicks on the book title on the screen, the robot introduces the book orally, complete with its own facial expressions and gestures. The ability to set the robot’s facial expressions, from how it moved to its color, was a big hit. Osawa said, “I was happy to see the older children taking the initiative to teach the younger ones how to use the robot.” He calls a robot in which the agent not only provides help, but also enhances the scene itself with its presence, a “catalytic agent.”

They are also developing a learning system for children. This system is designed to flip the script, having students learn by teaching the agent, rather than having the agent fulfill the teaching role. “These agents do not necessarily have to be smarter than humans. In fact, they just need to be a bit ‘less smart’ than humans. Our relationship with catalytic agents is one of the research themes we will explore moving forward.”

## Understanding the feelings of others

The second major pillar of Osawa’s research is the theme of social intelligence on the agents’ part. This research mostly pertains to the software that makes use of programming and algorithms, and tackles



Fig.1 “AgencyGlass,” glasses to anthropomorphize human

When worn by someone with visual impairment, the eyes in the glasses move naturally in response to the conversation going on as shown in the figure above. The device can be used in conversations with multiple people, allowing for smooth interactions.



**Fig.2 Book introduction robot**  
A child introduces a book, and the robot presents on it on their behalf. The audience lauded the robot's ease of use and adorable characters. The robot also helped enliven communication between children.



whether AI can understand the intentions of others and cooperate with them. One example of where AI can use this skill is a party game called *Werewolf* where participants talk to each other to find out who the “werewolves” hidden among them are. There has also been research on a game called *Hanabi*. Here, players are given a hand of cards that they cannot see and cooperate with one another by guessing what cards they have based on the other players’ hints. The key is to read the other player’s intentions, cooperate with them, or even double-cross them at times. This is the behavior that Osawa is researching how to make AI mimic.

AI has difficulty reading the people’s intentions like humans do, but if it acts in accordance with others’ personalities, it will perform better. “We need to design AIs that match human personalities,” says Osawa. “This includes AI that are bold risk-takers and those that are more cautious, quick-decision makers and ones that agonize over tiny minutiae.” He is working to improve performance through repeated gaming playtests with human subjects.

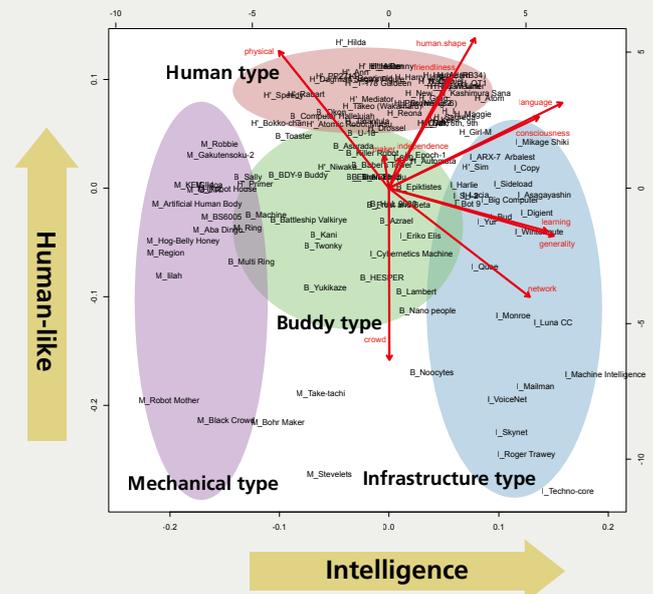
### Utilizing the method of science fiction for envisioning

The third pillar of Osawa’s research is the application of science fiction. Agents developed to support humans may encounter problems when they are put to use in society. In fact, the people who have explored and dug into this issue

the most are science fiction authors. Through his immense experience with communication of sci-fi writers, Osawa realized that it could hold the key to new idea for social agents.

Fig.3 shows a classification of different AI characters in science fiction. He classified them according to several parameters such as independence, friendliness, network size, and language ability, and used clustering and principal component analysis to find that there

- Human type**
  - Household chores, physical labor
  - Encounters with other cultures
  - Rebellion
- Buddy type**
  - Weapons and automated driving
  - Non-humanoid
  - Working with humans
- Mechanical type**
  - Simple operation
  - Low level
  - Rigid
- Infrastructure type**
  - Facility management
  - Network connectivity
  - Monitoring and control



**Fig.3 Classification of AI/robots in science fiction (SF mapping)**  
Statistical classification using the parameters in red allowed Osawa to categorize the agents into four personality types based on their “humanity” and “intelligence.” Two of these categories of AI/robots are underrepresented.

are four main types of AI depicted in science fiction. “Human- and machine-type agents have been around for a long time, but we can see the potential for new agents in the realm of buddy- and infrastructure-type agents, which lie somewhere in between them,” says Osawa. The Science Fiction Research & Development Center was established within Keio to serve as a base for this research.

Osawa is also researching “Sci-fi prototyping,” a method for identifying issues through science fiction. Usually, companies do “forecasting,” which is looking at the current situation to identify future challenges. Sci-fi prototyping involves “backcasting.” This is where science fiction writers and other relevant parties such as companies think about the future and its story, then work backwards to determine the route to get there. Using this method, future challenges and ideas that were difficult to identify using conventional methods will emerge in plain sight.

A sticking point for this research is the difficulty in deciding evaluation criteria. Choosing a standard for what is “acceptable” or “human-like” is complicated. There is also a large variation in results due to differences between individuals. Still, Osawa believes that “If even one person in ten can be saved, it should be done.” Moreover, he adds, “It is difficult because we are dealing with people, but that is the most interesting part.”

We look forward to Osawa’s research for a bright future where humans and agents can thrive alongside each other.

(Interview and text writer : Yuko Hiratsuka)



## His amazement at artificially created characters sparked his research into HAI

The Japanese affinity for communication robots seems to be distinctive. Osawa is deeply knowledgeable about different types of media such as science fiction and manga, and feels keenly the richness of Japanese society's sensibilities. Effortlessly crossing the boundary between science and the humanities, he leads the world in AI research that draws upon human sensitivity.

### What were things like for you as a child?

When I was in elementary school, my friend's older brother introduced me about notion of programming, and I noticed that I could make my own games. Then, in junior high and high school, I joined a programming club and had a lot of fun showing my friends the games that I created and playing them together. I wanted to work more in that field, so after high school I entered the Faculty of Science and Technology at Keio University.

There, I joined two student clubs: the Keio Robotics Society and the Science Fiction Society. When I was in my third year as an undergraduate and trying to decide what laboratory to join, a senior member of the Robotics Society recommended that working with Professor Imai would be a good option based on my interests, so I joined the Anzai-Imai Laboratory.

### How did Professor Imai influence you?

At the time, I was interested in algorithms and machine learning as they related to AI, so I told Imai-sensei, "I want to work on neural networks," to which he replied, "AI is where you interact with people and unpredictable things happen. What you'll find most interesting is thinking design about how to interpret these situations and respond. I recommend you to work on that." At that point, I thought, "What does he mean?" However, what happened later changed my mind.

The lab had a robot called "Robovie" designed for communication research. If you stretched out your arms and told it, "Give me a hug," the robot would pick that up on its sensors and come

up to you saying, "I love you!"

I tried it out, and the experience deeply moved me. I knew how it worked at the mechanical level, but I never expected to be so emotional. There are some things that you expect to know, but you can't actually fully understand them unless you experience them.

It was an unexpected discovery that when home appliances explain their own usage, measuring the user's eye movements revealed that the same speech can be understood differently depending on the character's position and settings.

### Amidst all your research achievements in anthropomorphism, you also conducted research on social intelligence, right?

My research on anthropomorphism was selected for a JSPS Research Fellowship and the "PRESTO" project of the National Institute of Science and Technology (JST). I continued my research as a visiting researcher at the National Institute of Informatics, a visiting researcher at the Massachusetts Institute of Technology AgeLab in the United States, a research associate at Keio University, and an assistant professor at Tsukuba University before returning to Keio in 2022, which is my current position.

I thought that anthropomorphism was the key to advancing AI research. Going forward, I wanted to do research on social intelligence in situations that involve responding to others, like having the AI cooperate with or betray you. During my time at the University of Tsukuba, I made use of the *Werewolf* game while collaborating with people from different research backgrounds to hone our ideas. We formed a voluntary-based group to continue this research, and its members are currently active at the forefront of various research fields.

### HAI research originated in Japan. How would you say it's spreading to the rest of the world.

The HAI Symposium has been held annually since its inception in 2006. From 2013, the symposium evolved into the HAI International Conference and is now held annually in Europe or Asia, taking place in countries such as Spain, South Korea, Singapore, Germany, New Zealand, Sweden, and the United Kingdom. This year I am one of the general chairs with the event being held in the fall at Keio's Hiyoshi campus.

The amount of investment in the US and in China towards AI research is off the charts. It is often said that Japan is lagging behind, but I believe it has a significant advantage in AI research in that it can collaborate in fields where it is strong, such as in quantum computing, materials engineering, chemistry, and biology. HAI is one such example. Japan is ahead of other





countries in its research and implementation of communication robots, and its synergy with character culture and virtual agents is also a strength.

**Would you say Japanese fiction is well-known around the world?**

Japan has a particularly vast treasure trove of visual and interactive fiction. You can find excellent media content in places like the US, Europe, and China, but overall, when you consider the community around secondary creation, you'll discover in Japan an environment for creative works that is truly diverse.

Just as the Comiket convention, a symbol of *doujinshi* (self-published print material) culture, branched off from the Japan Science Fiction Convention, Japan's wide range of works stems from SF culture. There's a lot that makes science fiction appealing, but one of them is that it's the world-building that directs the stories, rather than the people themselves. Because of that, rather than being restricted to depicting people as they are today, it has the advantage of being an avenue for doing thought experiments freely.

**How will research with SF develop in the future?**

For artificial intelligence research, we believe science fiction will be the next theme to nurture AI research. I think one challenge is figuring out how machines can support or even replace vision-building endeavors like sci-fi prototyping. To this end, we hope to discover new synergies by studying the science fiction as a genre.

**The new SF Center seems to be drawing a lot of attention, what is your takeaway?**

The SF Center was recently launched in 2024. I believe that Keio, as a university, has the flexibility to allow those in the humanities, sciences, or engineering, to easily collaborate on themes such as science fiction. I feel that we have the framework in place to tackle new challenges.

It was the well-known Japanese sci-fi author Sakyō Komatsu



who proposed the idea of having "Science Fiction Studies," but until now there have been few places that have taken it up as an academic discipline. Now preparations are underway for this line of research at the SF Center. This is probably possible only because Keio is the best private university in Japan.

**What do you keep in mind when teaching students?**

Basically, I respect what each student wants to do, and I want them to be able to pursue research according to their respective interests. However, it is sometimes difficult for fourth-year undergraduates to have a clear vision of what to do in the first place, so I try to give them a direct road map or have them work in groups with their senior classmates. For those in the master's program onward, I will respect what they decide to do for their own research. I will offer advice on how to maintain focus in their project, such as a theme's social nature, agent, and interactions to keep in mind.

I was like them myself, and I honestly want people to be free to do what they want. In particular, I would like to tell them, "Don't be afraid to try something new. It will be more fun in the end." If, after looking deep in yourself, you are convinced that you can make a case for what you want to do, I urge you to keep going without ever giving up. I believe that Keio is a place where this is possible.

◎ **Some words from students** . . . ◎

● He is very friendly. He knows a lot about the science fiction works, video games, and anime from my generation. I enjoy talking with him. He even joins events like softball tournaments. Our similar interests have made it easier for me to communicate my research, which has been helpful. (2nd year doctoral student)  
(Interview and text writer : Yuko Hiratsuka)

**For the full text of this interview**

<https://www.st.keio.ac.jp/en/kyurizukai/>



**I want people to pioneer research that creates not only temporary trends in Japan, but what lies ahead**

**Hiroataka Osawa**

Received his Ph.D. from the Department of Open and Environmental Sciences, Graduate School of Science and Technology at Keio University in 2009. That same year, he advanced to be a visiting researcher at Keio University. In 2011, he became a research associate at the Faculty of Science and Technology. He was an assistant professor of Systems Information Systems at the University of Tsukuba from 2013. From 2022 he has been holding positions as an associate professor at the Faculty of Science and Technology at Keio University and associate professor in Systems and Information Sciences at the University of Tsukuba. In addition, he has been active as a member of the Science Fiction and Fantasy Writers of Japan from 2019. In 2020 he became its director, and from 2022 to 2024 served as its president. He serves as the leader of the Science Fiction Research & Development Center.





**Group photo after Dr. Wu Yan's lecture: Keio SF Center and SFWJ (at the Generative AI Lab)**

This is a photo with the Chinese sci-fi author and researcher Dr. Wu Yan, together with members of our lab, our SF center, and the Science Fiction and Fantasy Writers of Japan (SFWJ). The SF Center offers many opportunities to interact with people from abroad.



**Costume parade at the CSCW 2025 (San Jose)**

This is from a party that took place after we presented on SF prototyping at the ACM Conference on Computer-Supported Cooperative Work and Social Computing (CSCW), held in Costa Rica. There, they have a tradition called Mascarada where people put on giant masks. One of my favorite things when presenting overseas is coming into contact with different cultures.



**SFWJ's statement on current generative AI at the World Science Fiction Convention (Chengdu, China)**

**Hiroataka Osawa's ON and OFF**

A diversity of knowledge and experiences give rise to new ideas



**Barbecue with lab members (Toyosato Yukarinomori Park)**



**Commemorative photo at training camp (Mongolia Village Tenger, Nasu Hot Springs)**

This is from our lab's training camp in AY 2024. We tried on traditional Mongolian clothing for this picture. Through these extraordinary experiences, I can get a glimpse of my students' hidden strengths that I don't see every day.

**Fishing during training camp (Nasu FishLand)**

In the midst of the COVID-19 pandemic, we started fishing as an activity that we could all enjoy together safely. This picture is from our last training camp. I was trying out lure fishing for the first time. I sometimes go fishing virtually via the VRChat platform, too.



**Fishing in the world of VRChat (Kon Lake Fishing, created by Suzuki @suzuki\_ith)**

# 私の 本棚

My favorite books



- 1** SF Sakka wa Kō Kangaeru–Sōsaku Sekai no Saizensen wo Tazunete [This is How a Sci-Fi Writer Thinks: Visiting the Frontlines of the Fictional Universe] (Hiroataka Osawa et. al., ed. the Science Fiction Writers of Japan, Kaguya Books)

A book by me, a non-writer, exploring the world of writers, published on the 60th anniversary of the founding of the SFWJ.

- 2** AI to Jinrui wa Kyōzon Dekiru ka?–Jinkōchinō SF Ansoroji [Can AI and Humanity Coexist? An Anthology of AI SF] (Satoshi Hase et. al., ed. the Japanese Society for Artificial Intelligence, Hayakawa Shobō)

This is a collection of stories where researchers and writers build upon each other to unleash the power of their imagination.

- 3** Other Minds: The Octopus, the Sea, and the Deep Origins of Consciousness (Peter Godfrey-Smith, trans. Dai Natsume, Misuzu Shobō)

This book discusses the intelligence of cephalopods that developed their own strain of intelligence separately from humans. A book that makes you realize that humanity is not unique.

- 4** Ai to Aizawa (Kanzenban) [Ai and Aizawa (complete set)] (story Kappi, adapted into a manga. Ume, No9 Inc.)

Written by Kappi, known for *Eren the Southpaw* and adapted into manga by Ume of *Giga Tokyo Toy Box* fame. A collaborative manga on artificial intelligence. This was the first work of fiction that I supervised.

- 5** AI Robot kara no Rinrigaku Nyuumon [An Introduction to Ethics through AI and Robots] (Munio Kukita et. al., Nagoya University Press)

This is a book where the finest philosophers summarize the ethical concerns of the latest AI and robotics technology. It is a handbook that serves not to limit research, but to generate research ideas.

- 6** Game Riron to Konnyaku Mondou [Game Theory and Mutual Misunderstanding] (Mamoru Kaneko, Nihon Hyōronsha)

A research book in the form of a play that makes you appreciate the world of research and researchers. Discusses the ever-difficult problem of disconnects between players' knowledge.

- 7** Persuasive Technology: Using Computers to Change What We Think and Do (B. J. Fogg, trans. Osamu Kōra and Chika Andō, Nikkei Business Publications, Inc)

Introduces “persuasive technology,” a new field involving computing systems designed to change people's attitudes or behaviors. This was an eye-opening concept.

- 8** SF Purototaipingū–SF kara Inobeshon wo Umidasu Shinsenryaku [Sci-Fi Prototyping: A New Strategy to Create Innovation from Science Fiction]

(Supervised and ed. Dohjin Miyamoto, co-authored and ed. Yuuki Namba and Hiroataka Osawa, Hayakawa Shobō)

Through interviews, this book explores a methodology to harness science fiction for innovation. This is how our sci-fi research started.

- 9** AI to SF [AI and Sci-fi] (ed. the Japan Science Fiction Writers of Japan, Hayakawa Shobō)

Published when I was president of the SFWJ. An anthology of contemporary science fiction writers' envisioning the latest AI concepts.

- 10** Reasons to Be Cheerful and Other Stories (Greg Egan, trans. Makoto Yamagishi, Hayakawa Shobō)

A collection of science fiction short stories that includes the theme of how people should live their lives if technology can edit things that are inherently un-editable, such as our feelings of happiness.

- 11** Shinrai wo Kangaeru–Rebaiasan kara Jinkūchinō [Thinking About Trust: From Leviathan to Artificial Intelligence] (Authored and ed. Tora Koyama, Keiso Shobō)

A book on trust, jointly authored by scholars in the humanities. A must-read if you want to get a solid grasp on the concept of artificial intelligence and trust in technology.

- 12** The Managed Heart: Commercialization of Human Feeling (Arlie R. Hochschild, trans. Jun Ishikawa and Aki Murofushi, Sekaishisoshā)

A masterpiece of sociology, this book introduces the concept of emotional labor to match people's emotions. Great scholars can put forward great concepts.

## The Freedom and Joy of Bringing Engineering to Society

Hiroataka Osawa

Ever since I was a child, I've always felt stressed when forced to follow some rule. More precisely, I've always had difficulty following social norms and rules that I didn't agree with, and this has caused many conflicts and headaches. What gave me the perfect escape were the stories I saw in science fiction, where common sense as we know it didn't apply and the rules of the real world and society were different.

One of the major turning points in my life was when I was introduced to computers and programming in junior high school. The computer has its own unique world where I could make all the rules from scratch. In the beginning I accidentally deleted all the data on my computer. I cried and used my allowance money to buy and install a new operating system, but even then, I found a sense of comfort in my sorrow because all faults were my own responsibility.

Another turning point was when I earned my doctorate in engineering at Keio University. This gave me free license, so to speak, in engineering. Studying the natural sciences also grants you freedom, but whereas science is the study of "knowing what we don't know," engineering is the study of "making what was impossible, possible." And it is you who decides what is "impossible" and, by extension, what is "worth making possible."

To put it another way, in engineering, usefulness, not just novelty, is allowed to fuel leaps forward. Engineering can formulate its own logic (of course, what it puts out in the world still gets scrutinized), and take us all a step forward, reshaping our understanding of "common sense."

However, I would like to add a few caveats when using the metric of "usefulness" in engineering research. I avoid expressions that denigrate someone else's research as "useless." This type of thinking risks succumbing to someone else's common sense, putting a lid on our ideas.

Rather, I wish to talk about a change in our perspective, where we are free to contextualize

why and how something could be useful. Usefulness can be a toxic thought, but when used with the right perspective, it can enhance how we think.

Now, I'd like to circle back to the idea of the "sociality of humans" that caused me so many headaches as a child. Having gained a better perspective, we can start to understand the dynamic structure behind the common sense and rules of human society. It is a complex structure in which three or more types of agents are interdependent and recursively influence each other. It is even more complex than the natural environment, and I can see why it bothered me as a child. But, as it turns out, there is no more interesting system in the universe.

And we, as engineers, may not only be able to understand, but be able to show a better picture of society.

So, my message for those who are struggling with their research and career paths is this. You should at least be proud of yourselves because what you find interesting is useful to you. Think about why it is interesting to you. Draw out its pieces, analyze them, and expand your reach further.

## 理 工 学 Information

### The Keio University's Graduate School of Science and Technology has put up its "Special Site" online resource. A new educational and research structure from April 2026



In advance of the reorganization of the Graduate School of Science and Technology scheduled to take effect in April 2026, the school opened its "Special Site" in June 2025. This page explains the idea behind the reorganization, the curriculum accompanying it, and the new research unit system grounded on the basic philosophy of "emerging."



For further details about this site, please access the link on the left.  
<https://emerging.st.keio.ac.jp>

#### Editor's postscript

Osawa mentioned the *Yukikaze* series by Chōhei Kambayashi, which features a buddy-type AI character. The title brought back fond memories, so I went to my bookshelf and picked up my own copy, reading it after more than a decade. In one memorable scene, a character interacts with a computer, which ultimately sees the inefficiency of the work that humans do and concludes that humans should be removed from the equation. Coming back to this story for the first time in more than ten years, I felt it hitting differently today. What surprised me the most was that this was a series published from 1979. How will today's sci-fi authors depict the future? This question crosses my mind constantly, and I've started going to the sci-fi section every time I visit the bookstore. (Fuhito Sugihara)

Cover of current issue : Osawa with the robot "Shaberun," named by an elementary student

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