



OUT OF THE BOX

Funded by
DFG Deutsche
Forschungsgemeinschaft
German Research Foundation

Centre for the Advanced Study
of Collective Behaviour



Universität
Konstanz



Merz Akademie
Hochschule für Gestaltung,
Kunst und Medien • Stuttgart
staatlich anerkannt

Out of the box

Everyone has played a game before. Most likely in a group too. Making games about collective behaviour makes sense, doesn't it? For this reason, the Cluster of Excellence Centre for the Advanced Study of Collective Behaviour (CASCb) is conducting a project in collaboration with the Merz Akademie, University of Applied Arts, Design and Media, Stuttgart, in the 2023 summer semester that focuses on the development of collecti-

ve games. "Collective behaviour, the subject of our current research, is fascinating as well as extremely important in today's age for the understanding of groups and societies and can help make sense of the world," the researchers Nico Gradwohl und Vishwanath Varma say. Both postdoctoral researchers from the CASCb had in mind to introduce people (including pupils) to the principles of collective behaviour.

Principles of collective behaviour

1. Simple rules such as following or avoiding neighbours can result in complex, coordinated patterns of group behaviour.
2. Diverse abilities and tendencies of individuals can make a group greater than the sum of its parts.
3. Feedback loops facilitate rapid amplification or stabilization of group behaviours.
4. Structures of networks and rules of transmission determine how information spreads through a group.

From the first idea to the implementation

The researchers had been interested in the utility of games for engaging learners and had previously experimented with simple interactive formats for teaching complex ideas. "I felt that using games to illustrate collective behaviour in action may be an effective way to communicate the principles behind collective movements of locust swarms to contagion of ideas through networks," biologist Vishwanath Varma says.

"We soon noticed that with limited expertise and resources our games may be nice prototypes but won't look nice without an awful load of effort besides our research projects," psychologist Nico Gradwohl says. "Thus, collaborating with people with an eye for design and aesthetics seemed like an amazing opportunity to further our goal, also dividing labor." That is why they were interested in collaborating with the arts students from the Merz Akademie – an ongoing collaboration between the University of Applied Arts, Design and Media and the Cluster of Excellence CASCb.

Together with Mario Doulis, Professor for New Media at the Merz Akademie, they put the idea into practice: "At a previous exhibition Vishwanath Varma talked about his wish to work on a set of games that would explain basic principles of collective behaviour in a playful way," Doulis says. He was in favour of starting a game project because: "Most people I know like playing games. Developing a game offers to designers the opportunity to mix fun with work. But there are a lot of different games, and it is a very challenging and complex task to design one. And a lot of games already exist. Best starting conditions for a semester project!"

The ground rules of collective behaviour form the basis of all games that the 12 students at the Merz Akademie created are working on. The spectrum ranges from classic board games and computer games to digital escape rooms. Ants, bees, ravens, and fireflies are the animal heroes on the game board.

About the collaboration

The students came to Konstanz for three days to gain an insight into the research topics and to learn the basic rules of collective behaviour at the CASCB. "Talking to the artists also helped me clarify concepts in my head, develop my own ability to simplify and clearly communicate my research, and identify important questions that I may want to work on in the future," Vishwanath Varma says. A joint game night was also not to be missed. With the versatile ideas, the students travelled back to Stuttgart and worked on the projects - not without challenges, as Mario Doulis describes: "The challenge for students is to align their widespread ideas to the project's purpose, to explain the basic principles of collective behaviour. To do so sometimes means to give up your favorite idea and to work on another one. An important learning process for design students."

Game event at the CASCB on 5 July

All involved researchers love the visuals of the projects: "I am truly amazed by the variety of ideas that the students came up with and I am really looking forward to seeing them come to fruition," Nico Gradwohl says. "I think, that this may truly help to illustrate some core principles of collective behaviour to educate people about the mechanisms we hold so dearly." On 5 July, the results will be presented at CASCB and of course will be played together!

The Merz Akademie

The Merz Akademie is a University of Applied Art, Design and Media in Stuttgart, founded in 1918. The fields of study are: Crossmedia Publishing, Film and Video, New Media and Visual Communication with special interest in theory and cultural studies.

The Centre for the Advanced Study of Collective Behaviour

At the Centre for the Advanced Study of Collective Behaviour (CASCB), we create a global hotspot for the integrated study of collective behaviour across a wide range of species and across scales of organisation. We are a Cluster of Excellence within the framework of the Excellence Strategy of the federal and state governments.

Involved People

Course leaders:

Mario Doulis and Jörg Frohnmayer, Merz Akademie

Researchers:

Nico Gradwohl, Liang Li, Prasetia Putra, Wataru Toyokawa, Vishwanath Varma, CASCB/University of Konstanz

Students:

Elvin Ayanoglu, Tamina Büttner, Jonas Eckert, Karl Hartnigk, Philipp Hinterkopf, Isabel Kohlhagen, Marco Lüdtke, Alexandra Müller, Cynthia Onde-Breuil, Marisa Scarpulla, Lars Schiefer, Dorothea Siebert, Merz Akademie

Organization and Communication:

Elisabeth Böker, CASCB

Out of the box: Playing collective games

Social groups are ubiquitous. Individuals benefit from social learning and cooperation, but also suffer from competition. Living in such groups requires coordinated action, resulting in collective behaviour.

Why should I care?

Ever wondered how fireflies flash in sync or how millions of locusts march together? Collective behaviour may have some answers for you. We humans live in collectives too, physical and digital. Similar collective principles determine how networks of individuals transmit information and make group decisions. Understanding these principles better could help us shape our own world.

Why games?

What better way to learn about probability than from the roll of the dice? Help ant and bee colonies manage their collective dynamics or cooperate with your partner to navigate a digital escape room. This exhibition allows you to experience some principles of collective behaviour first-hand. Try to spot them while playing the games.

Some important principles

Simple rules

Have you seen those dazzling, coordinated movements of bird flocks or fish schools with no clear leader or conductor orchestrating them? No, it is not telepathy, as originally suspected. Simple local rules of following or avoiding immediate neighbours can explain these complex movements. Play simple games and experience how behaviour changes with the environment and its obstacles.

Feedback loops

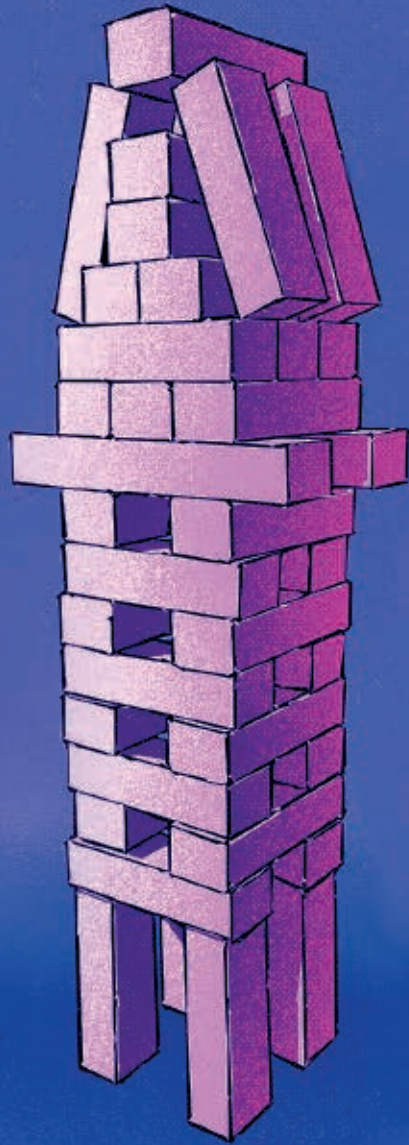
A hallmark of collective behaviour is feedback loops. One minute you see a lonesome ant discovering your candy jar, the next minute a whole trail of ants has formed. This is the power of positive feedback. When your candy is all gone, the ants quickly disappear too, by virtue of some negative feedback. Your actions affect other players and their actions affect you.

Variability

Different individuals contribute various skills to their group/swarm. Did you know, for example, that octopuses team up with fish to hunt? From insect colonies with different castes to diverse human teams, such groups can be more than the simple sum of their parts. Play with different players and experience various roles.

Social information use


Just like us, many animals use information that others provide. For example, birds learn how to open milk bottles and use tools by observing other birds. The social networks of such animals and their learning patterns can determine how information spreads through groups, just like how opinions spread through social media. Learn from other players and share your information with them – but beware of those who try to deceive you.



MIDNIGHT TOWER

Cynthia Alejandra Onde-Breuil

"Midnight Tower" is a cooperative game where players work together to build a tower, assuming different roles with unique abilities. Through strategic decision-making and discussions, players aim to construct the specified tower or uncover and eliminate the saboteur. The game offers variations, challenges players' communication skills, and provides insights into the evolution of collective knowledge and strategies.

A dark crow is shown in profile, flying towards the left. Its wings are spread, and its tail feathers are visible. The background is a solid, muted blue color. The crow's eye is a small, light-colored spot on its dark face.

MADNESS OF THE CROW

Tamina Büttner

Ravens and crows have been mysterious creatures in many tales for a long time. They are exciting creatures for sure. In "Madness of the crow" you will explore the general behaviour of ravens and crows and you will need to collaborate as a team. To win the game, it's important to help each other, but you won't get far when you're not also deceiving your mates...

ant empire



ANT EMPIRE

Dorothea Siebert

A fascinating and complex microcosm, which after all accounts for 20% of the earth's biomass, fights for survival every day. Where we do not look, the fierce war of the ants is taking place. Opponents are attacked, torn to pieces and the battlefield is left full of corpses. Entire ant colonies are wiped out and the drama of life unfolds in its harsh reality. Still, the territory must be explored, the nest maintained, and the offspring raised. There has to be enough food for everyone - boredom can't happen.

You can experience exactly this thrill when you slip into the role of an ant in "Ant Empire". Together with your partner, you'll have to explore the land, develop tactics, build your empire, and destroy the enemy. Will you manage to survive the ant world war and win as the only colony?

KING OF THE SWARM

Marco Lüdtkke

In the card game "King of the Swarm" you play with up to 4 players, to find out who can grow his own swarm to be the biggest and take over the world! (Or just a small piece of it.)

You play cards for your own benefits, to disrupt the plans of other players, and most of all to have fun! There are also cards that affect everybody in the game, like a twister or the uprising of the smaller swarms.

Finally, you can choose your specific swarm (bees, birds, locusts, crabs, ants or fish) to get individual aspects, of these specific animals, to help yourself and maybe strike deals with other players!





AQUARIUM ADVENTURES

Elvin Ayanoglu

In the captivating game "Aquarium Adventures," you take control of the brave fish named Golan, who lives in a dangerous aquarium. Your mission is to help Golan survive by cleverly seeking protection in the fish school. Utilize the collective strength of the swarm to ward off dangers and overcome thrilling challenges.



BEECRAFT

Lars Schiefer

“BeeCraft” is a 2D point-and-click, management, single-player computer game. You manage a small portion of bees, giving them tasks for what to do next.

It is not accurate to the life of an actual bee but it is possible to see how their life actually progresses via info panels.



A FIREFLIES FAIRYTALE

Isabel Carolin Kohlhagen

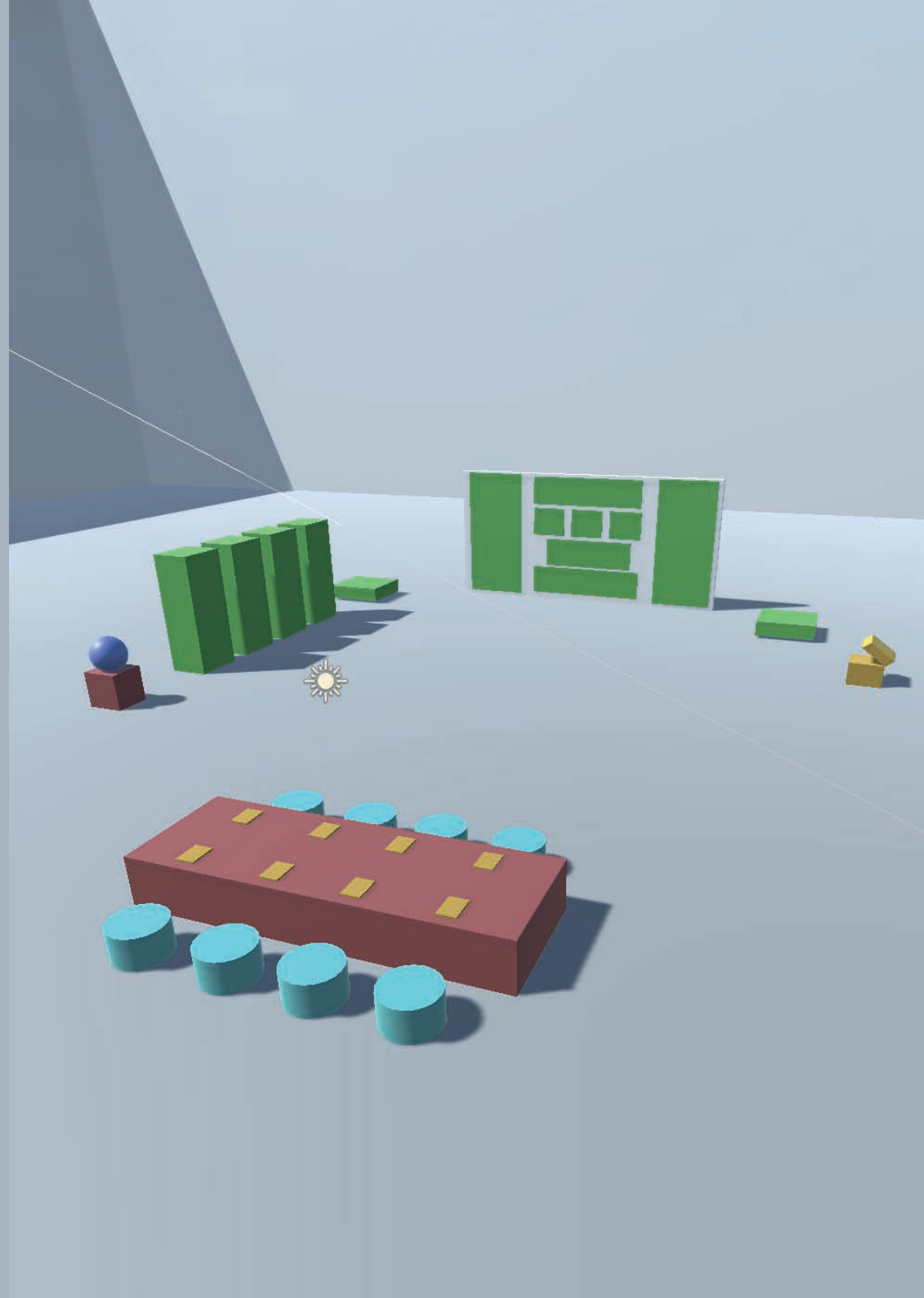
In "A Fireflies Fairytale" you enter an enchanting world where male fireflies seek the love of a female firefly. This multiplayer game requires two players and one keyboard, with each contestant controlling a male firefly using the "A" and "L" keys respectively. The goal is to synchronize your own lanterns with the swarm in the background, utilizing principles of collective behaviour such as synchronization, selfishness, social dynamics, and adaptive patterns. The winner of each round attracts the female firefly and if one player successfully captures her attention, they emerge victorious.

BETTER TOGETHER

Karl Hartnigk

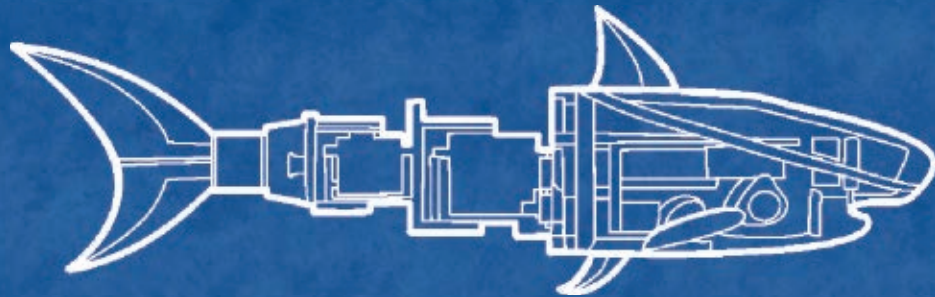
In this coop game you and your teammate find yourselves trapped, each confined to separate rooms. Your only hope of escape lies in collaboration and communication. With a shared goal, you must work together to solve a series of intricate puzzles scattered throughout the rooms.

Furthermore, the game includes a system for item exchange. While confined to your separate rooms, you can pass objects between each other. Your success depends on understanding the significance of each item and how it relates to your partner's predicament. Sharing the right objects at the right time is crucial for your escape.



OTTO'S JOURNEY THROUGH THE OPEN SEA

Alexandra Müller



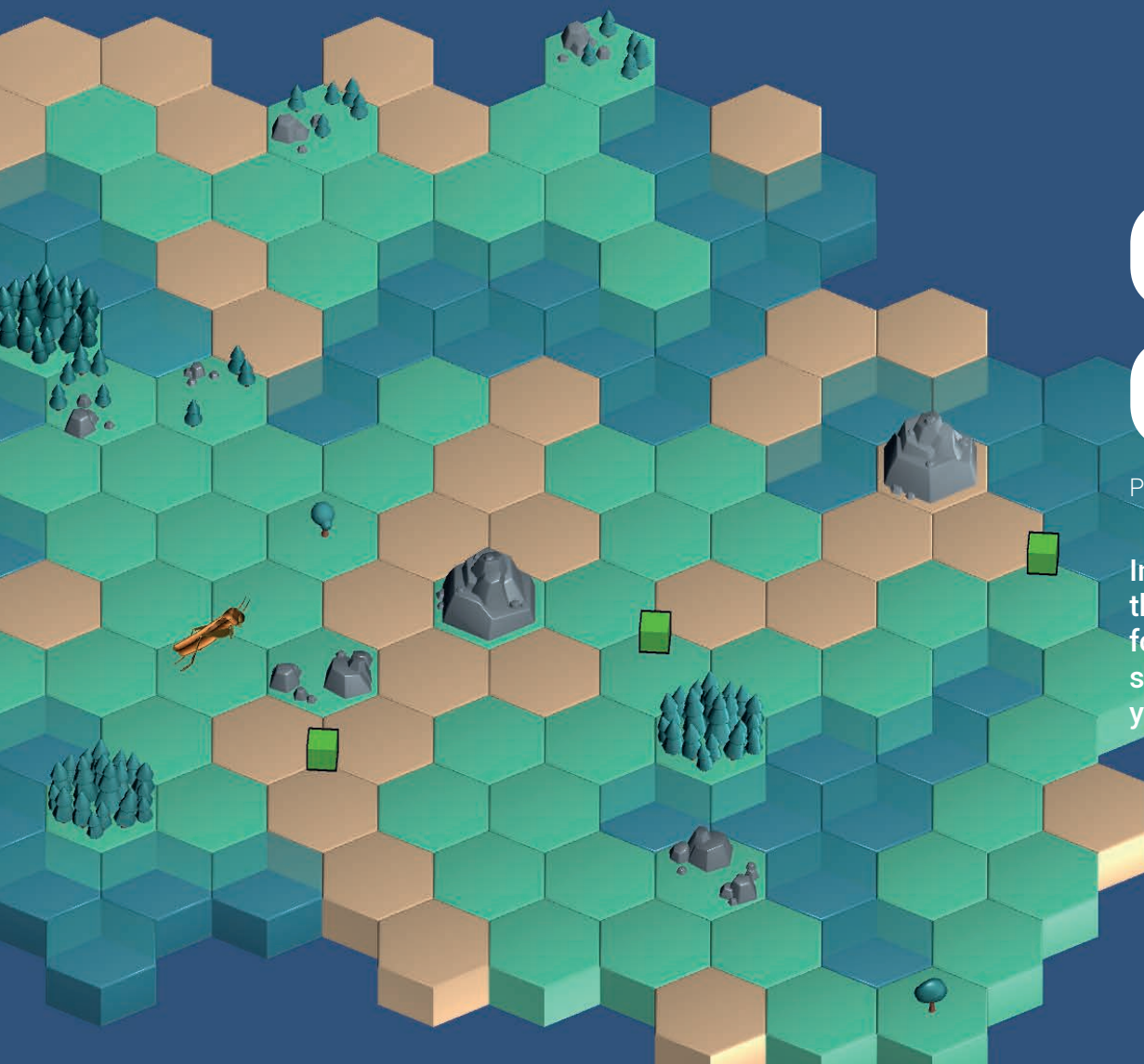
In the interactive book "Otto's journey through the open sea", you help the little fish Otto to get through the open sea. On his way, you have to help him with various decisions, which will influence the difficulty of his journey and his final destination. You and Otto are going to make some friends and learn more about the behaviour of fish.

A 3D-rendered desert landscape with a grid of grey rectangular blocks. A large wooden pillar stands in the center. The scene is set in a vast, flat, orange-brown desert under a cloudy sky.

GREGARIOUS

Jonas Eckert

"Gregarious" is a top-down puzzle game centred around locusts and their swarms. Explore the intricate dynamics of locust behaviour as they interact with their environment and one another. Your goal is to solve each level's puzzle by strategically placing and manipulating items within the scene. Once ready you start the simulation and watch the locusts' behaviour play out.



CHIRP AND CONQUEROR

Philipp Hinterkopf

In "Chirp and Conqueror" you will explore the fascinating world of the locusts. Start with one locust and grow your swarm by finding food and navigating different environments. Manage resources, survive challenging terrain, and aim for high scores as you guide your locusts to new territories in this strategy game.

THE GREAT BEES GAME

Marisa Scarpulla

"The Great Bees Game" offers fun for big and small. Help the honeycomb farmers by answering the right questions and secure the new offspring of the queen bee! Your goal is to finish a puzzle before completing the question cards.

The game provides educational information about the bees. But beware! Not all answers are as clear as you might think at first glance.

