



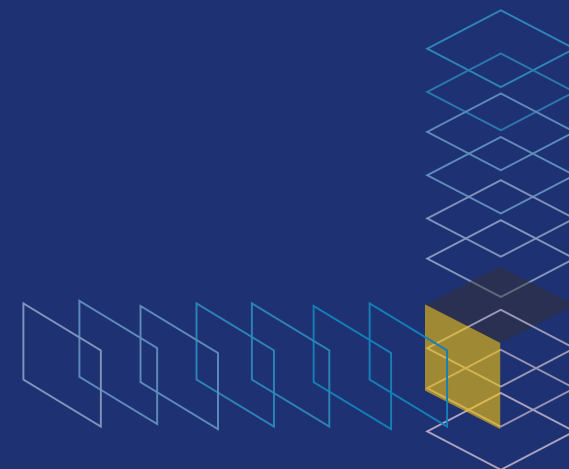
# WEB3D 2020

## 3D for a Hyperconnected World

The 25th International ACM Conference on 3D Web Technology  
November 9-13, 2020, Virtual Conference, Seoul, Korea



Korea  
Computer Graphics  
Society





# WEB3D 2020

The 25th International ACM Conference on 3D Web Technology  
November 9-13, 2020, Virtual Conference, Seoul, Korea

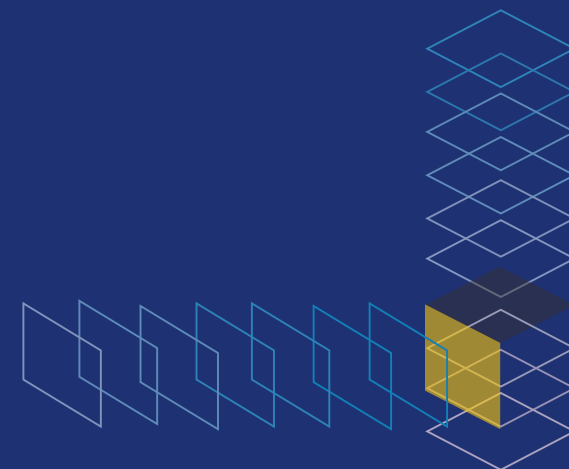
# Welcome

# 환영합니다

# 欢迎



Korea  
Computer Graphics  
Society



# Plenary 1



Byoungyun Yoo  
KIST  
Finance Chair



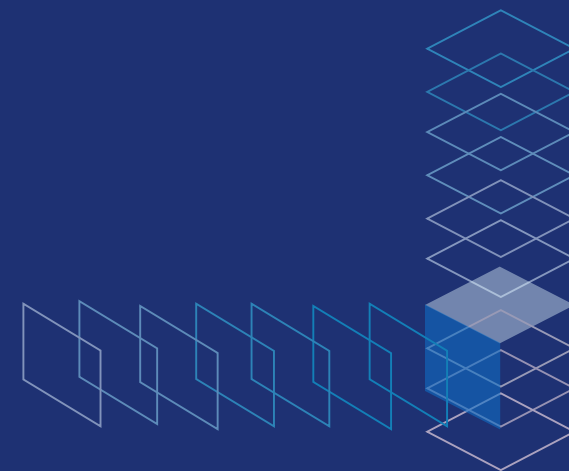
# WEB3D 2020

The 25th International ACM Conference on 3D Web Technology  
November 9-13, 2020, Virtual Conference, Seoul, Korea

# OPENING



Korea  
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# Official Opening



Soonhung Han  
KAIST  
General Chair



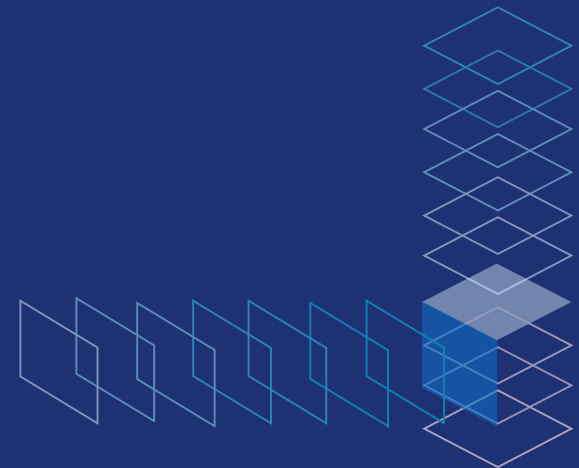
# WEB3D 2020

The 25th International ACM Conference on 3D Web Technology  
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# Welcome



Korea  
Computer Graphics  
Society



# General Chairs



Soonhung Han  
KAIST



Don Brutzman  
Naval Postgraduate School



Jehee Lee  
Korea Computer Graphics Society

# Welcome Message



Jehee Lee  
Korea Computer Graphics Society  
General Co-Chair



# Welcome Message



Don Brutzman  
Naval Postgraduate School  
General Co-Chair



# Keynote



Kwangyun Wohn  
KAIST

Keynote



# VR as a media in the age of the 4-th industrial revolution

Kwangyun Wohn  
KAIST

Gold Sponsor



# Sponsors



ACM SIGGRAPH

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**Korean Federation of Science &  
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**KSA** KOREAN  
STANDARDS  
ASSOCIATION

# Special Thanks



Cultural Heritage  
Administration



# Special Thanks



Whanyong Lee  
Ajou University  
Web Co-Chair

# Student Volunteers



**TIN HOK**  
Chungbuk National University, Korea



**Dong Liang**  
Tongji University, China



**Mingi Yeom**  
KAIST, Korea



**Mutahar Safdar**  
McGill University, Canada



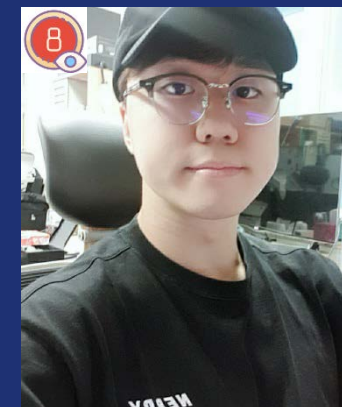
**Tulga Tuvshin**  
Jeonbuk National University, Korea



**Wonjun Seong**  
Konkuk University, Korea



**Jihwan Kim**  
KIST/SeoulTech, Korea



**Kim Jaeun**  
Korea University, Korea

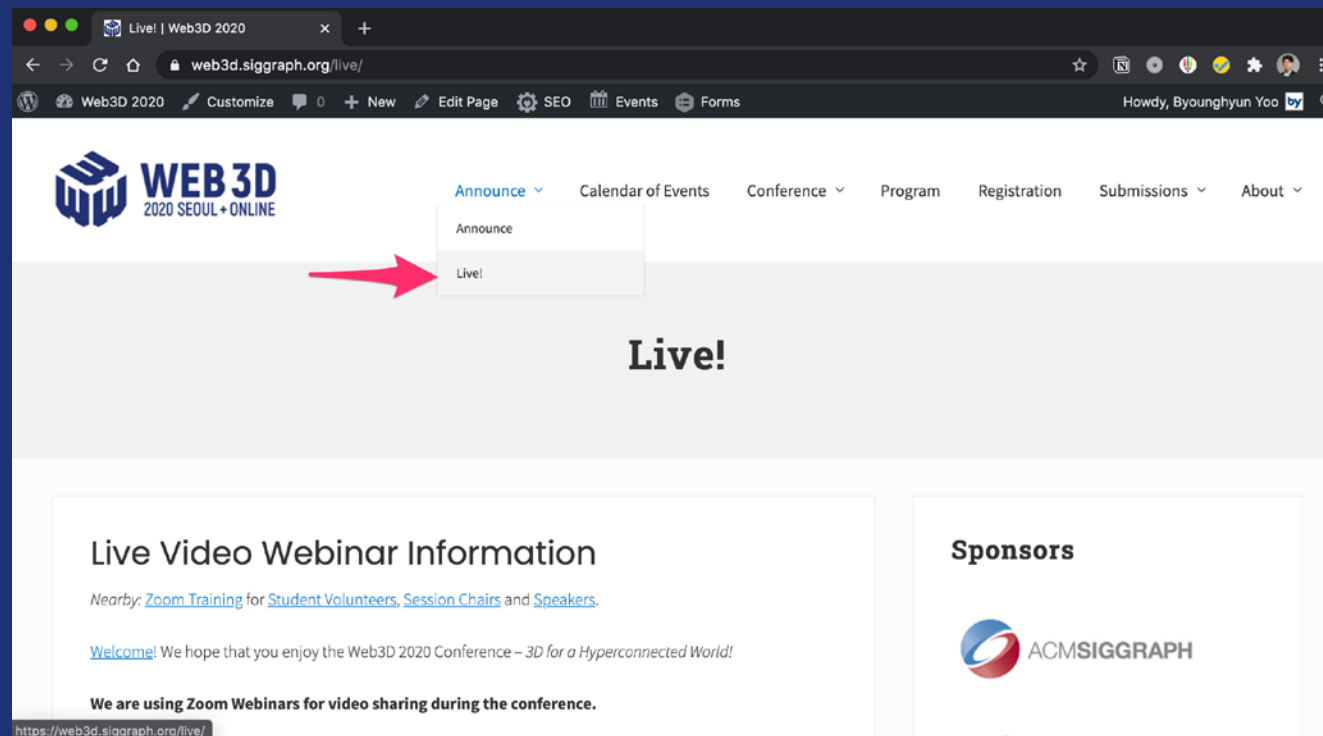
# Virtual Conference Orientation



Byoungyun Yoo  
KIST  
Finance Chair

# Check Live!

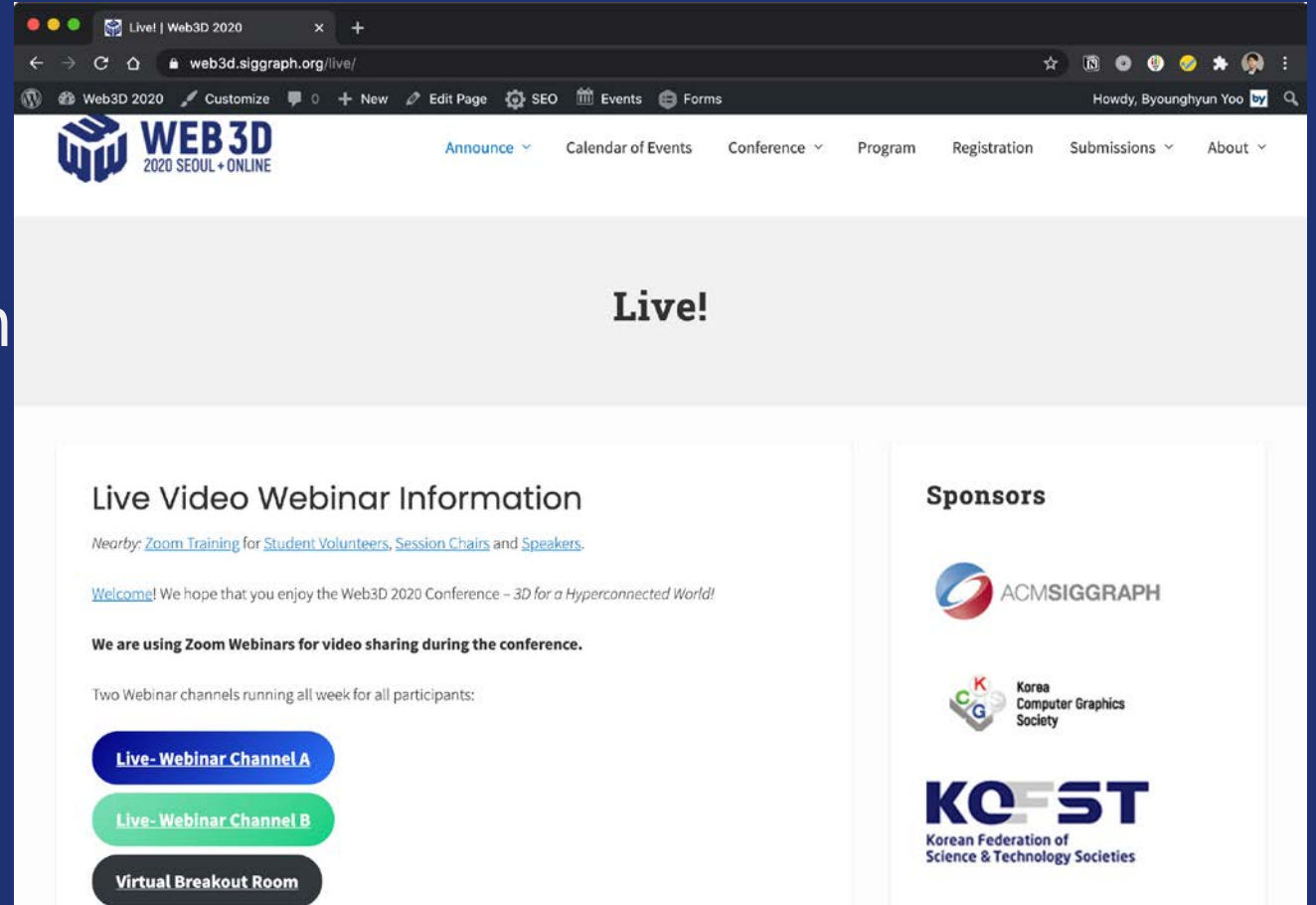
- We are using Zoom Webinars for video sharing during the conference.
- Connection information is available only on a single page: Live!



The screenshot shows a web browser window with the URL [web3d.siggraph.org/live/](https://web3d.siggraph.org/live/). The page features a navigation menu with the following items: [Announce](#), [Calendar of Events](#), [Conference](#), [Program](#), [Registration](#), [Submissions](#), and [About](#). A red arrow points to the 'Live!' option in the 'Announce' dropdown menu. Below the navigation menu, the text 'Live!' is prominently displayed in a large, bold font. The page content includes a section titled 'Live Video Webinar Information' with links for 'Zoom Training for Student Volunteers, Session Chairs and Speakers', a 'Welcome!' message, and a statement: 'We are using Zoom Webinars for video sharing during the conference.' To the right, there is a 'Sponsors' section featuring the ACMSIGGRAPH logo.

# Check Live!

- Two Webinar Channel
  - Live-Webinar Channel A
  - Live-Webinar Channel B
- One Virtual Breakout Room
  - Gather.town



The screenshot shows a web browser window with the URL [web3d.siggraph.org/live/](http://web3d.siggraph.org/live/). The page features a navigation menu with links for [Announce](#), [Calendar of Events](#), [Conference](#), [Program](#), [Registration](#), [Submissions](#), and [About](#). The main content area is titled "Live!" and includes a section for "Live Video Webinar Information". This section contains a link for "Zoom Training for Student Volunteers, Session Chairs and Speakers", a welcome message, and a statement: "We are using Zoom Webinars for video sharing during the conference." Below this, it lists "Two Webinar channels running all week for all participants:" and provides three buttons: "Live- Webinar Channel A", "Live- Webinar Channel B", and "Virtual Breakout Room". On the right side, there is a "Sponsors" section with logos for ACMSIGGRAPH, Korea Computer Graphics Society, and KCEST (Korean Federation of Science & Technology Societies).

# Conference Proceedings

- **ACM Digital Library**
  - Web3D '20: The 25<sup>th</sup> International Conference on 3D Web Technology
- Digital Proceeding will be open during the conference
- Each paper on our conference website has a link to the ACM DL page



# Schedule - Week View

Events for week of 9 November

web3d.slggraph.org/events/

Web3D 2020 Customize 0 New SEO Events Forms

Howdy, Byoungyun Yoo

**WEB3D**  
2020 SEOUL+ONLINE

Announce Calendar of Events Conference Program Registration Submissions About

## Events

*Be careful please!* Calendar Events are scheduled using in [Coordinated Universal Time \(UTC\)](#) but your display might show a different local time zone. Please check entries to be certain – downloading events to your calendar is helpful. To confirm, here is a [Time Zone Calculator](#).

Search for events Find Events Week

<> Today **November 9 - November 15**

	MON 9	TUE 10	WED 11	THU 12	FRI 13	SAT 14	SUN 15
	On-demand video ... Papers and Poster...	On-demand video ...	Web3D 2020 Zoom Channels Live				
1 am				12:00 am - 1:30 am HAnim Competition Awards	12:00 am - 1:30 am Industrial Use Cases (IUC) #1		
2 am				1:30 am - 3:00 am Tutorial #6, Humanoid Animation (HAnim)	1:30 am - 3:00 am Standards Session #4, VR Cyber Sickness		
3 am							
4 am							
5 am							
6 am							
7 am							
8 am			8:00 am - 9:30 am Papers session #1: Reality and Virtuality in Practical XR	8:00 am - 9:30 am Standards Session #1, 3D Printing and Scanning	8:00 am - 9:30 am Industrial Use Cases (IUC) #3		
9 am							
10 am			9:30 am - 11:00 am Tutorial #1, WXR Remote Cooperation	9:30 am - 11:00 am Standards Session #2, Smart Cities (Europe-Asia)	9:30 am - 11:00 am Industrial Use Cases (IUC) #4		
11 am							

# Schedule - List View

Upcoming Events

web3d.siggraph.org/events/list/

Web3D 2020 Customize 0 New SEO Events Forms

Howdy, Byoungyun Yoo

**WEB3D**  
2020 SEOUL+ONLINE

Announce Calendar of Events Conference Program Registration Submissions About

## Events

*Be careful please!* Calendar Events are scheduled using in [Coordinated Universal Time \(UTC\)](#) but your display might show a different local time zone. Please check entries to be certain - downloading events to your calendar is helpful. To confirm, here is a [Time Zone Calculator](#).

Search for events Find Events List ^

< > Today Now - November 11 ~

November 2020

- MON 9 **Featured** November 9 [↗](#)  
**On-demand video of selected presentations**  
This day is dedicated for viewing on-demand video of prepared presentations. Enjoy!
- MON 9 **Featured** November 9  
**Papers and Posters Published**  
This calendar entry is online at <https://web3d.siggraph.org/event/papers-and-posters-published> ACM Digital Library is publishing all Web3D 2020 papers and posters today, available without charge to the public for the next 30 days. ...
- TUE 10 **Featured** November 10 [↗](#)  
**On-demand video of selected presentations**  
This day is dedicated for viewing on-demand video of prepared presentations. Enjoy!
- TUE 10 November 10 @ 1:00 PM - 3:00 PM UTC  
**Zoom Training: Speakers**

Korea Time	UTC Time		WED 11th Nov		THU 12th Nov		FRI 13th Nov	
			Track A	Track B	Track A	Track B	Track A	Track B
09:00 -12:00	00:00 -03:00	00:00 -01:30	(No session)		Paper session #4 (Chair : Kwan-Hee Yoo)	H-Anim Competition (Chair : Myeong Won Lee)	Paper session #5 (Chair : Takeshi Kurata)	Industrial Use case #1 (Chair : Kyoungro Yoon)
		01:30 -03:00			Workshop #2 (Chair : Sung-Hee Lee)	Tutorial #6 (Chair : Joe D.Williams)	Standard Session #4 (Chair : Hyun Kyoon Lim)	Industrial Use case #2 (Chair : SangHee Shin)
17:00 -20:00	08:00 -11:00	08:00 -09:30	Paper session #1 (Chair : V.Marchetti)	(No session)	Poster Session #2 (Chair : Hyung-Seok Kim)	Standard Session #1 (Chair : ByoungNam Lee)	(No session)	Industrial Use case #3 (Chair : Christophe Mouton)
		09:30 -11:00	Paper session #2 (Chair : Jinyuan Jia)	Tutorial #1 (Chair : Byoungyun Yoo)	(No session)	Standard Session #2 (Chair : Peter Ryan)		Industrial Use case #4 (Chair : YongWoon Kim)
22:00 -24:00	13:00 -15:00		Plenary #1 (Chair : Byoungyun Yoo) Keynote by Kwangyun Wohn (KAIST)		Plenary #2 (Chair : Nicholas Polys) Keynote by Neil Trevett (Khronos Group)		Plenary #3A Get Involved! Plenary #3B Awards	
(Next day) 02:00 -05:00	17:00 -20:00	17:00 -18:30	Paper session #3 (Chair : Christophe Mouton)	Tutorial #2 (Chair : Don Brutzman) & Tutorial #3 (Chair : Andreas Plesch)	Workshop #1 (Chair : Feng Liu)	Standard Session #3 (Chair : Don Brutzman)	(No session)	
		18:30 -20:00	Poster session #1 (Chair : Sung-Hee lee)	Tutorial #4 (Chair : Jakub Flotyński) & Tutorial #5 (Chair : Eftychia Lakka)	Workshop #3 (Chair : Carol McDonald)	(No session)		

# Program at a glance

- <https://web3d.siggraph.org/conferences2020/program/>

**WEB 3D 2020 ONLINE**

Announce - Calendar of Events - Conference - Program - Registration - Submissions - About

## Program

Category	Count
Primary Sessions	159
Tutorials	104
Workshops	4,838
Standards Sessions	234,095
Workshops	726
Workshops	19,879
Workshops	87
Workshops	430

23 sessions of 30 min each are available as on-demand content.

We are getting ready to bring all of the following sessions will soon be added here, and also will be added in the [Calendar of Events](#). Video and presentation materials are getting posted on-line for each event.

### PAPERS

Twenty-four papers presenting original work in 3D Web research and applications have been selected by the program committee.

- [Papers session #1: Reality and Virtuality in Practical XR](#)
- [Papers session #2: 3D Web for Hyperconnected Applications](#)
- [Papers session #3: CAD Scalability and Resilience on the Web](#)
- [Papers session #4: Extending Web3D/VR/AR to Content and Effects](#)
- [Papers session #5: Big, Small, Broad, Deep and Close](#)

### PLENARY SESSIONS

Marking the 25th Anniversary of the Web3D Consortium - 20th

- [Plenary #1: Conference and Session Welcome](#)
- [Plenary #2: Khronos Update, Web3D Consortium Town Hall, and Panel Discussion](#)
- [Plenary #3A: Web3D 2021 Committee \(planning discussion for next year\)](#)
- [Plenary #3B: Web3D Conference Awards and Acknowledgements](#)

### POSTERS

Eleven Web3D Conference posters present results of ongoing or recently completed work in 3D web research and applications. Full ones are available for questions and discussion to poster attendees. Cutting-edge work. Each poster has been comprehensively screened by the program committee and is published as part of conference proceedings in the ACM Digital Library.

- [Posters Session 1 - 10 Posters Session 2](#)

### SPECIAL TRACK: INDUSTRIAL USE CASES (IUC) and DIGITAL TWIN (DTW) VISUALIZATION

Posters on use cases demonstrate how 3D web technologies may be used in industrial applications. This special annual track during Web3D 2020 is again devoted to industrial use cases for 3D applications, best practices and necessary requirements for using 3D in various application domains.

- [Industrial Use Cases \(IUC\) and Digital Twin \(DTW\) Visualization](#)

### STANDARDS SESSIONS

These focused sessions provide a meeting opportunity for researchers and practitioners, ranging across the Web and 3D, to find common interests, to discuss ideas and exchange information on emerging 3D Web standardization topics.

- [Standards Session #1: Opportunities for 3D Printing and Scanning Interoperability](#)
- [Standards Session #2: Smart Cities \(European Union\)](#)
- [Standards Session #3: Smart Cities \(American Forum\)](#)
- [Standards Session #4: VR Cyber Sickness: Evaluation, Measurement, Standards](#)

### TUTORIALS

Six tutorial tutorials are presenting introductory or advanced applications of 3D Web technologies to the core and to experienced practitioners. Tutorial subjects include practical advice for authoring content in 3D scenes and in using 3D graphics in diverse application areas.

- [Tutorial #1: Web3D Remote Collaboration using WebXR Technology](#)
- [Tutorial #2: X3D Capabilities and HTML5 Publishing](#)
- [Tutorial #3: X3D Demos: Players and Text Support](#)
- [Tutorial #4: X3D Ontology for Semantic Web Query of 3D Models and Metadata](#)
- [Tutorial #5: X3D Spatial Sound, Web Audio API and Acoustic Properties](#)
- [Tutorial #6: Humanoid Animation \(Human\) Motion Animation and Skeletal Modeling](#)

### WORKSHOPS

Workshops provide a forum for researchers and practitioners from both the Web and 3D environments to come close to discuss and exchange positions on current and emerging 3D web topics. Workshops are presentation sessions moderated by web3d.org members or open discussions of new knowledge on a specific topic of interest. Many past workshops have led to important new lines of work.

- [Workshop #1: Web3D User Experience \(Web3DUX\)](#)
- [Workshop #2: Recent Advances in Virtual Avatar Technology](#)
- [Workshop #3: Web 3D and Material Exchange: Adoption Requirements](#)

### DEMONSTRATIONS

This year's **Demonstrations** session presents work from artists, content designers, and developers on their innovative 3D scenes, interactive and application developed on web3d.org platforms, including the web3d.org mobile and VR/AR systems on being proposed.

Demonstrations to submission deadline is this week, please submit your work for consideration!

### HANIM COMPETITION

This annual competition is dedicated to showcasing the best 3D animation (3D) and Extended Reality (XR) graphics standards can be used for creating an enriched music video. The competition is organized by the Korean Standards Association (KSA) and Web3D Consortium. Judges will select three monetary prizes.

- [Hanim Music Video Competition Awards](#)
- [Web3D Submission Requirements](#)
- [Original submission deadline: 2020-09-24 \(August 24th\) 10:00 AM \(KST\)](#)

Video submission deadline closed: **24 October 2020**

### Program Index

- [Home](#)
- [Primary Sessions](#)
- [Tutorials](#)
- [Special Track: Industrial Use Cases \(IUC\) and Digital Twin \(DTw\)](#)
- [Standards Sessions](#)
- [Workshops](#)
- [Demos](#)
- [Video Competition](#)

### Sponsors

- [ACM SIGGRAPH](#)
- [Korea Computer Graphics Society](#)
- [KOST](#)  
Korean Federation of Science & Technology Societies
- [KSA 한국표준협회의](#)
- [KHRONOS GROUP](#)
- [web3D CONSORTIUM](#)

# Zoom Desktop Client

- Use the latest version of Zoom desktop client
  - <https://zoom.us/download>

## Zoom Client for Meetings

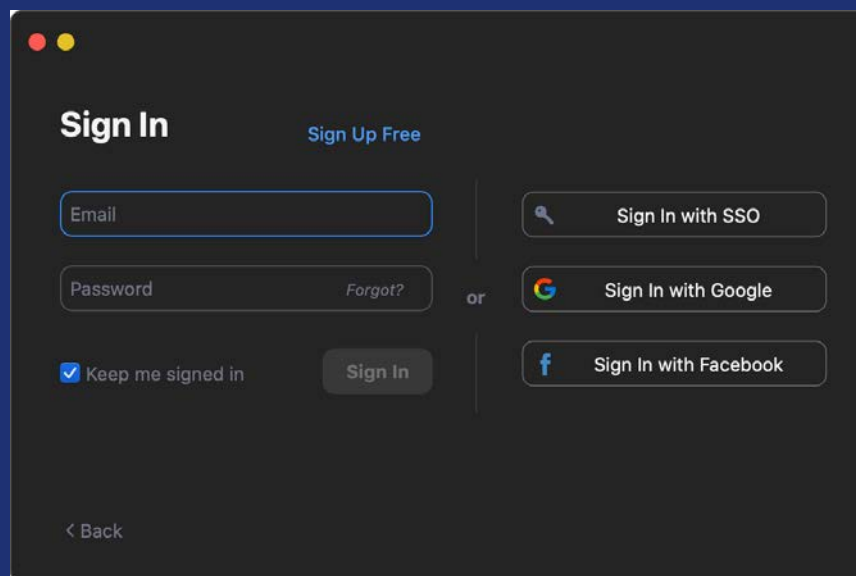
The web browser client will download automatically when you start or join your first Zoom meeting, and is also available for manual download here.

[Download](#)

Version 5.4.2 (58740.1105)

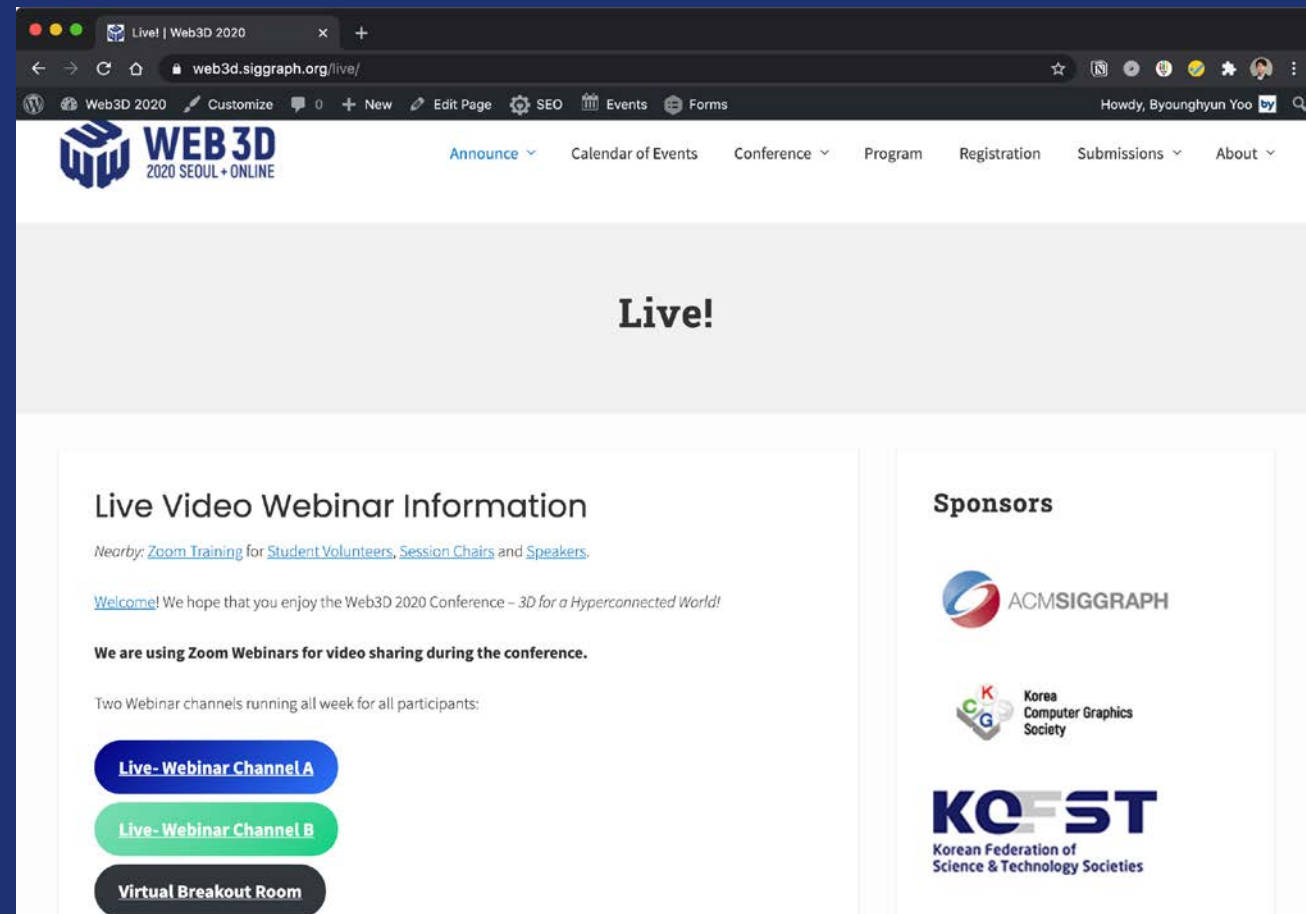
# Zoom Account for Presenter

- Presenter should be logged in with the same email address for your Zoom account you used in your accepted paper or poster to be promoted to a panelist (presenter) from an attendee

A screenshot of the Zoom Sign In page. The page has a dark background with white text. At the top left, there are three colored window control buttons (red, yellow, green). The main heading is "Sign In" in white, with a link "Sign Up Free" in light blue to its right. Below the heading, there are two input fields: "Email" and "Password". The "Password" field has a "Forgot?" link to its right. Below the "Password" field is a checked checkbox labeled "Keep me signed in" and a "Sign In" button. To the right of the "Email" and "Password" fields, there is a vertical line with the word "or" in the middle. To the right of this line are three buttons: "Sign In with SSO" (with a magnifying glass icon), "Sign In with Google" (with the Google logo), and "Sign In with Facebook" (with the Facebook logo). At the bottom left, there is a "< Back" link.

# Zoom Webinar Connection

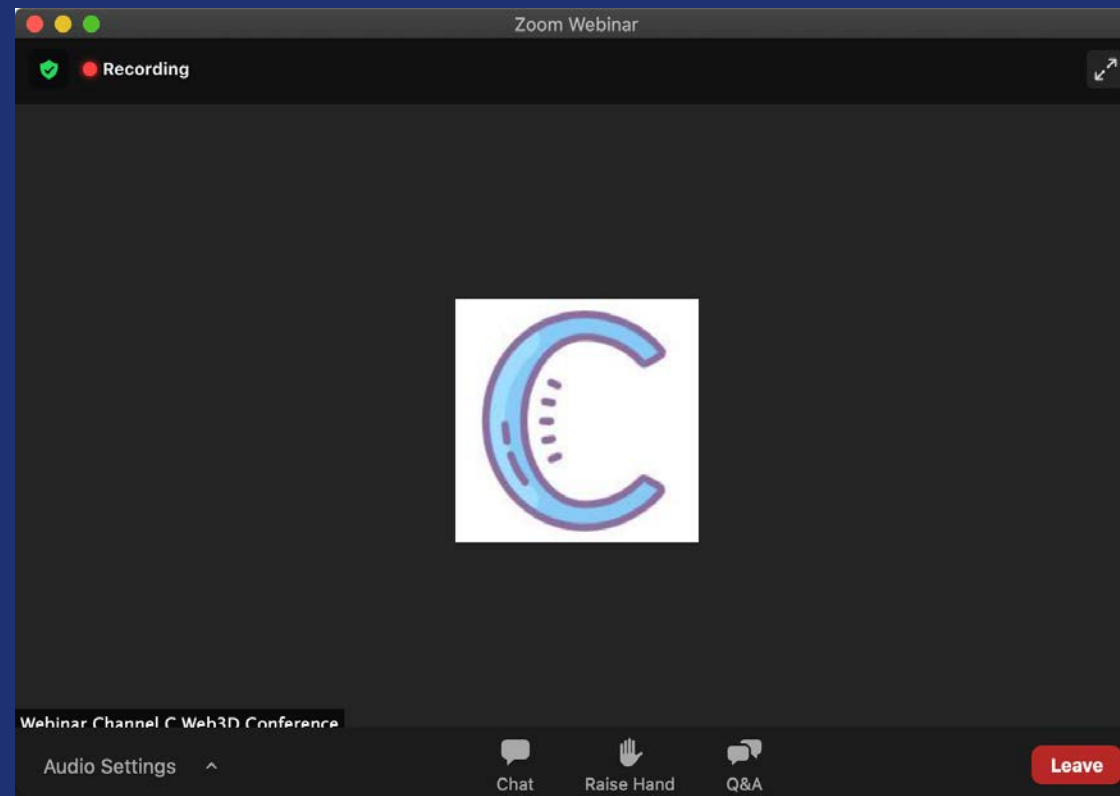
- Connect Webinar by the button in the Live! Page
  - <http://web3d.siggraph.org/live>



The screenshot shows a web browser window displaying the 'Live!' page of the Web3D 2020 conference website. The page features a navigation menu with links for 'Announce', 'Calendar of Events', 'Conference', 'Program', 'Registration', 'Submissions', and 'About'. The main content area is titled 'Live!' and contains a section for 'Live Video Webinar Information'. This section includes a 'Nearby' link for Zoom training, a welcome message, and a statement that Zoom webinars are used for video sharing. Below this, it lists two webinar channels and a virtual breakout room, each with a corresponding button: 'Live- Webinar Channel A' (blue), 'Live- Webinar Channel B' (green), and 'Virtual Breakout Room' (black). To the right, there is a 'Sponsors' section featuring logos for ACMSIGGRAPH, Korea Computer Graphics Society, and KCFST (Korean Federation of Science & Technology Societies).

# Zoom Webinar Attendee Interface

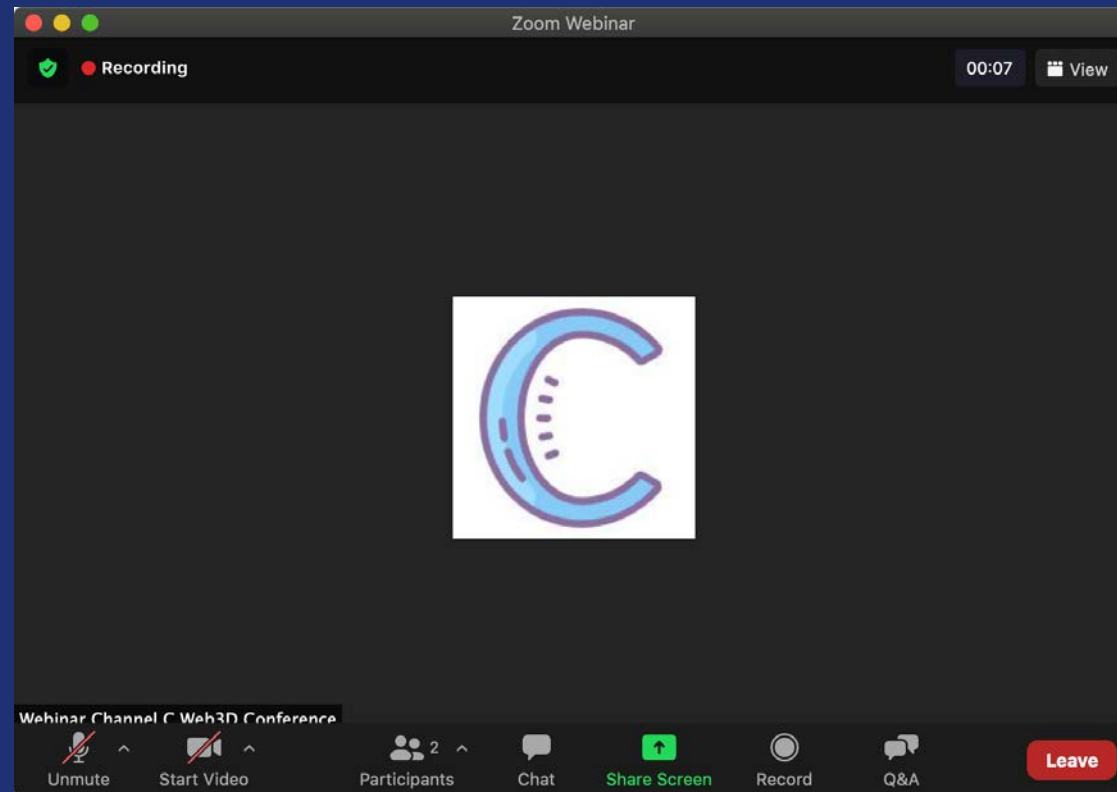
- If you see this interface, you are now an **attendee**
  - 3 buttons in bottom line (Chat, Raise Hand, Q&A)



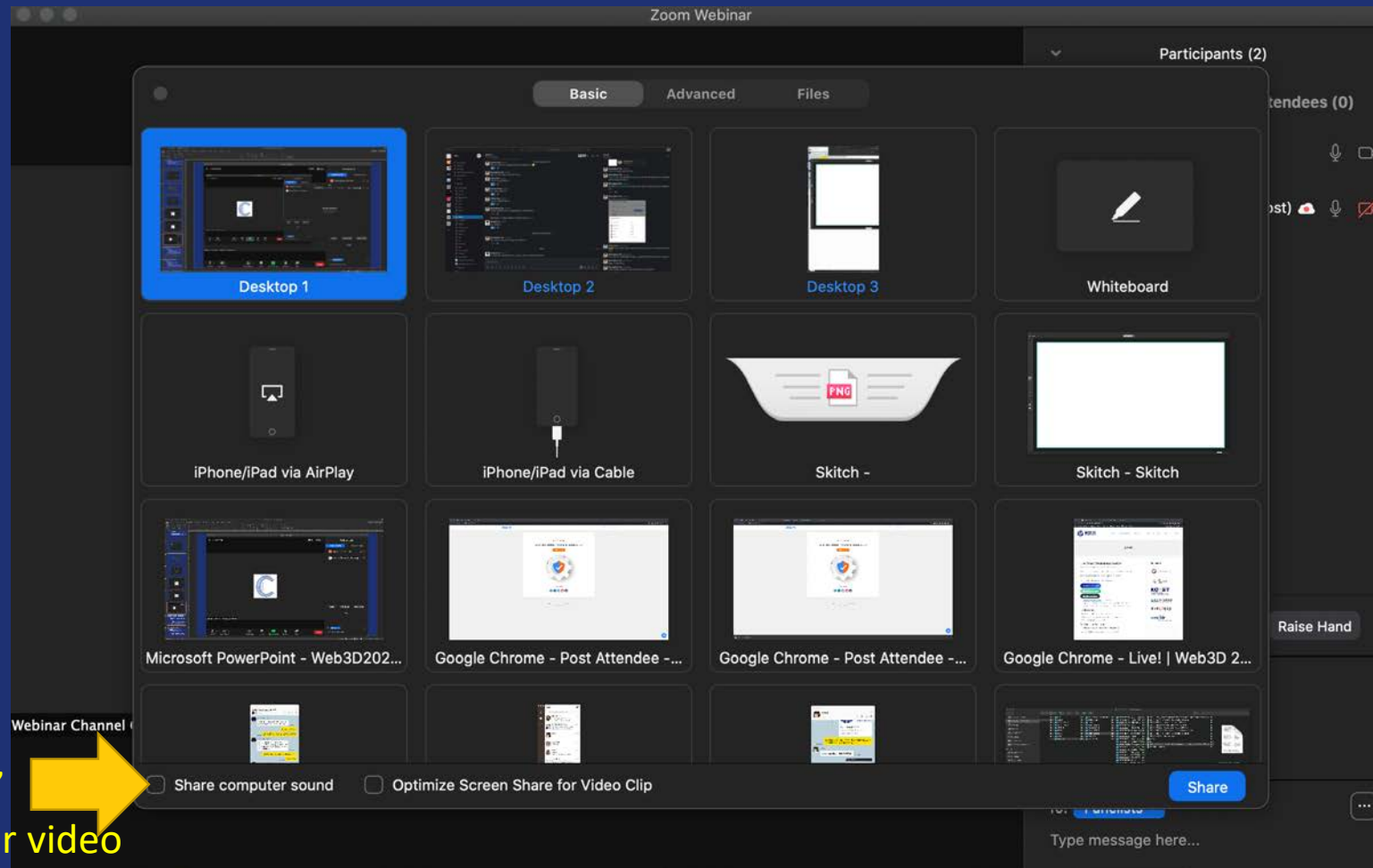


# Zoom Webinar Panelist Interface

- A speaker should be promoted to a panelist for a presentation
- If you have more button, you are promoted to a panelist



# Share Screen and Sound



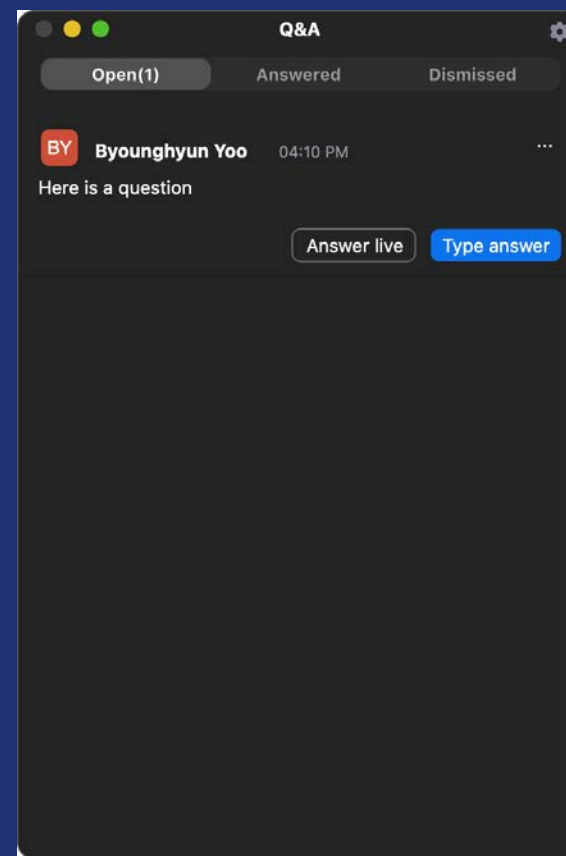
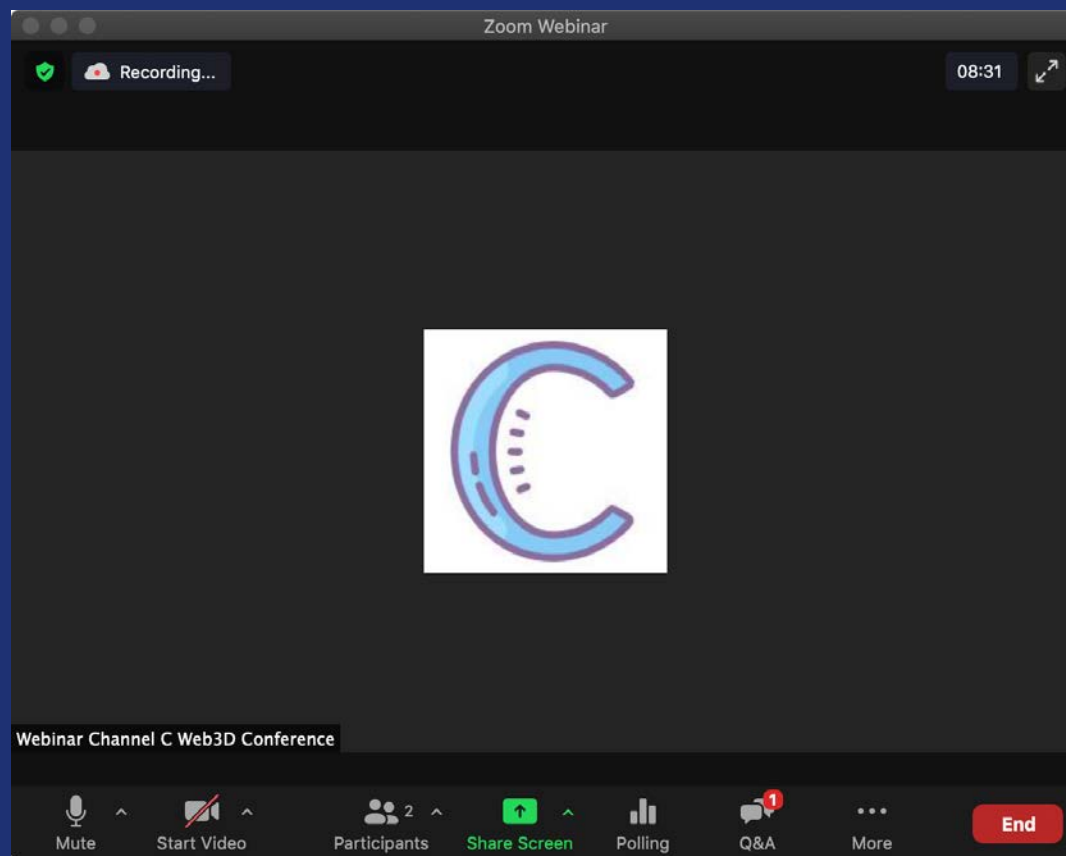
Please check  
"Share computer sound"  
if you need sound in your video

# Zoom Webinar Panelist Registration

- All authors' email address of paper and poster sessions for each day will be registered as a panelist before UTC 00:00 of the same day of your presentation
- It means you should be automatically promoted to a panelist if you used your email address used in your accepted paper
- If you are still an attendee, send an urgent chat message to panelists

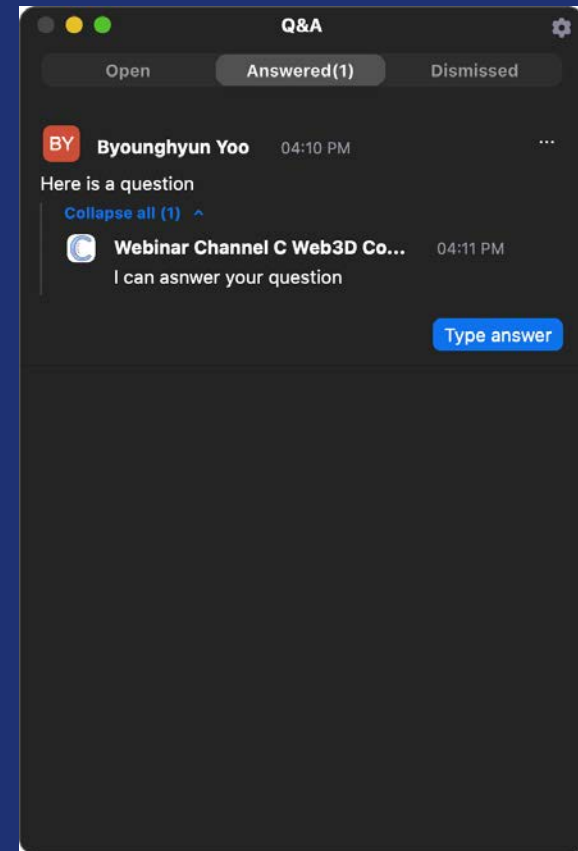
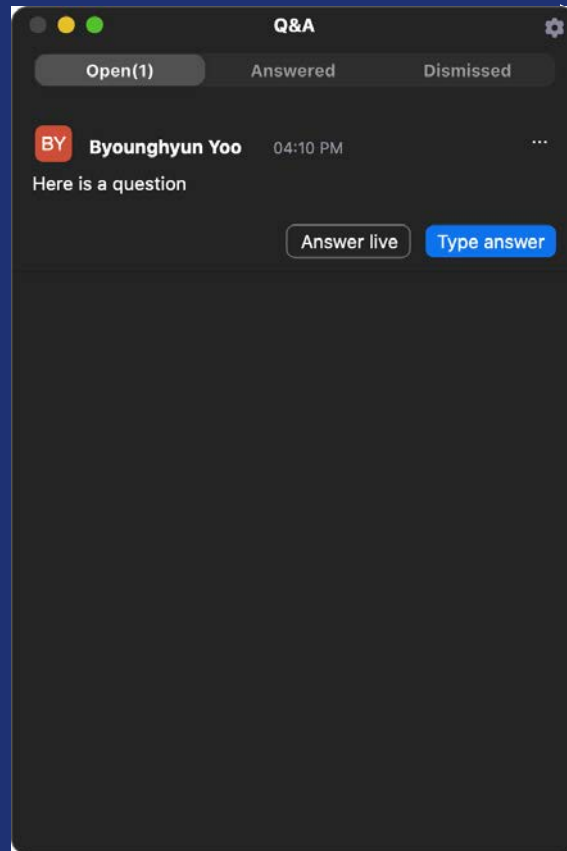
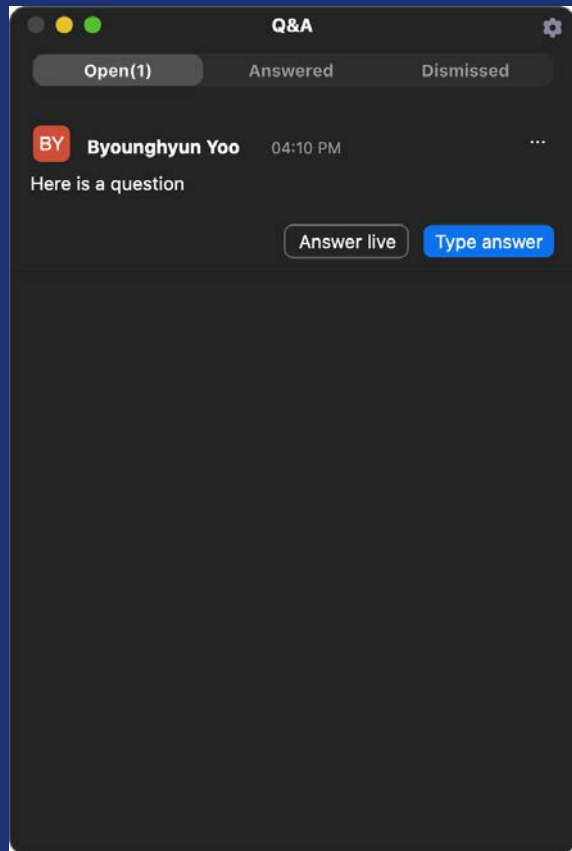
# Zoom Webinar Q&A

- Badges notification shows the number of Question on the Q&A button



# Zoom Webinar Q&A

- "Type answer" is recommended for a short answer
- "Answer live" is recommended for a long answer



# Speaker Preparation Channel

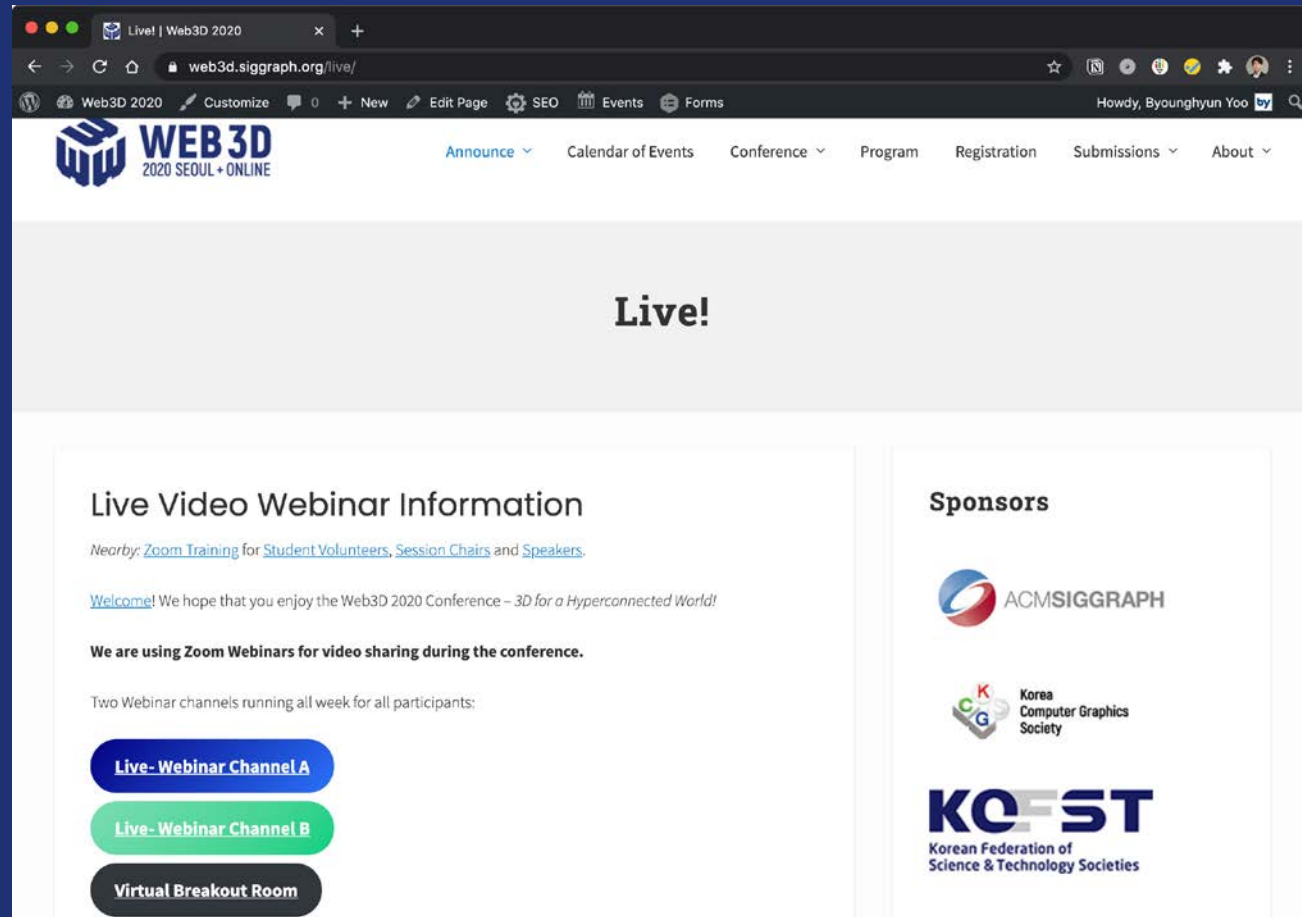
- For speakers of Thursday and Friday in UTC, please use [http://bit.ly/web3d\\_C](http://bit.ly/web3d_C) as the speaker preparation room.

# Conference Web



Whanyong Lee  
Ajou University

# Virtual Break Room



The screenshot shows a web browser window with the URL [web3d.siggraph.org/live/](http://web3d.siggraph.org/live/). The page features a navigation menu with links for 'Announce', 'Calendar of Events', 'Conference', 'Program', 'Registration', 'Submissions', and 'About'. A large 'Live!' banner is centered on the page. Below the banner, the 'Live Video Webinar Information' section includes links for 'Zoom Training for Student Volunteers, Session Chairs and Speakers' and a welcome message. It also states that Zoom Webinars are used for video sharing and lists two webinar channels: 'Live- Webinar Channel A' and 'Live- Webinar Channel B', along with a 'Virtual Breakout Room' button. The 'Sponsors' section on the right lists ACMSIGGRAPH, Korea Computer Graphics Society, and KCEST (Korean Federation of Science & Technology Societies).

Live!

### Live Video Webinar Information

Nearby: [Zoom Training](#) for [Student Volunteers](#), [Session Chairs](#) and [Speakers](#).




[Welcome!](#) We hope that you enjoy the Web3D 2020 Conference – *3D for a Hyperconnected World!*

**We are using Zoom Webinars for video sharing during the conference.**

Two Webinar channels running all week for all participants:

- [Live- Webinar Channel A](#)
- [Live- Webinar Channel B](#)
- [Virtual Breakout Room](#)

### Sponsors

-  ACMSIGGRAPH
-  Korea Computer Graphics Society
-  **KCEST**  
Korean Federation of Science & Technology Societies



- 1) Enable video
- 2) Use arrow keys
- 3) Have fun

**Letsee**  
AUGMENTED REALITY AVAILABLE ON WEB

WEBSITE | CASE STUDIES | ABOUT US | SOC MEDIA | CONTACT

You are here

Coffee Break

Letsee | PartDB | KIST | KSTEP

PartDB Co., Ltd.  
(주) 부품디비

DOME, Jamwo Bank

Peggy

WRL

↑ About us...WRL

← Our works

← WXR Tutorial I | ← Paper

KIST

Decentralized WebXR  
Our previous work--

www.kstep.or.kr

KSTEP Korea STEP Center

PLM-MES

ISO Project Status

Demonstration Video

PLM-MES Poster

DTw Concept

DTw Use cases

KSTEP

Outdoors



# WEB3D 2020

## 3D for a Hyperconnected World

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