



A.I. Smart Parking Management System, On-line Video education Platform, AI Microscope

LightVision AI Solutions

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Online Education Platform with AI-based T2B* and B2T** (even if visually acute teachers do not know braille, they can teach math/science to visually impaired students)

* T2B(Text-To-Braille): Translation process from text to braille (forward translation)

** B2T(Braille-To-Text): Translation process from braille to text (backward translation)



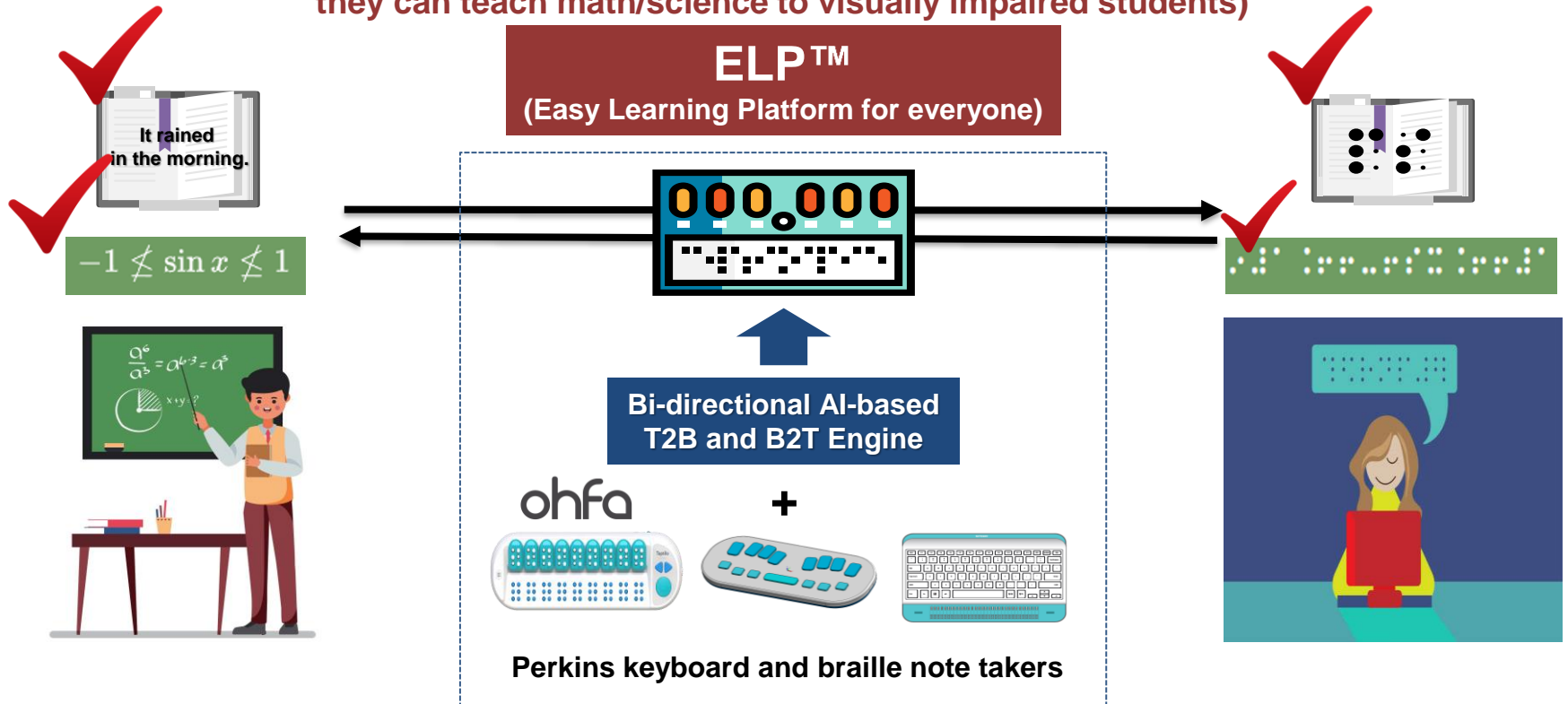
Development Background of ELP™

- In a pandemic situation like COVID-19, visually impaired people cannot access online education
- Limited number of special education teachers who know braille
- Incorrect text to braille translation results (converting small information to large information)
 - Impossible to communicate with teachers who do not know braille
- Math/science education for the visually impaired is very hard due to the absence of math/science T2B and B2T translation S/W



Neglecting online education for the visually impaired

Online Education Platform with AI-based T2B and B2T
(even if visually acute teachers do not know braille,
they can teach math/science to visually impaired students)





Examples of communication failures due to B2T translation errors

If Korean + English + punctuation marks are mixed, communication failures occurred due to B2T translation errors

STEP1, STEP2는 기초학습 과정이다.

다음 단계는 STEP2이다.

→ **세뉘1, 세뉘2** 는 기초학습 과정이 **뉘**

→ 다음 단계는 **세뉘2**이 **뉘**

학습방법의 Tip

Part1의 1일차 학습분량을 소화하고 난 후, TEST-기출문제로 복습하세요.

학습방법의 **세설뉘**

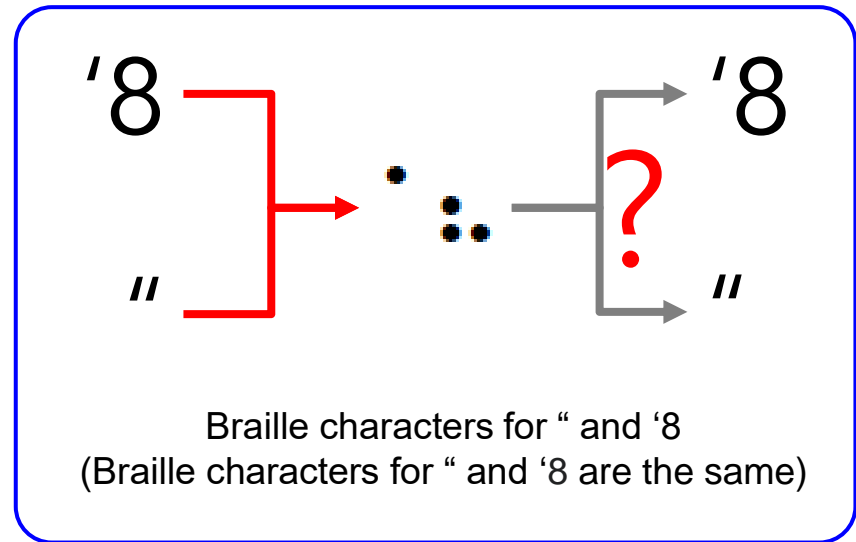
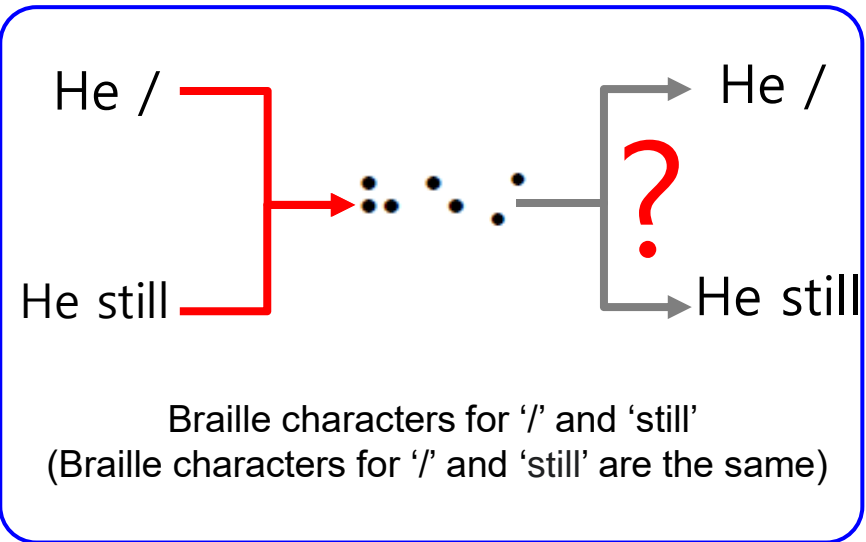
→ **세스뉘1**의 1일차 학습분량을 소화하고 난 후, **세설뉘**기출문제로 복습하세요

*Reference: Guidelines for production of revised Braille books (National Library for the Disabled)



Problem Analysis

Since the 1:1 correspondence relationship between text and braille is not established, correct translation of braille is difficult with the existing character replacement method.



Example Sentences in Braille	Braille Translation Results
	He still meets his wife
	He / meets his wife
	“ hundreds of people “
	‘8 hundreds of people ‘8



Problem Analysis

Since the 1:1 correspondence relationship between text and braille is not established, correct translation of braille is difficult with the existing character replacement method.

Braille characters for '어!' and '억'
(Braille characters for '!' and 'ㅋ' are same)

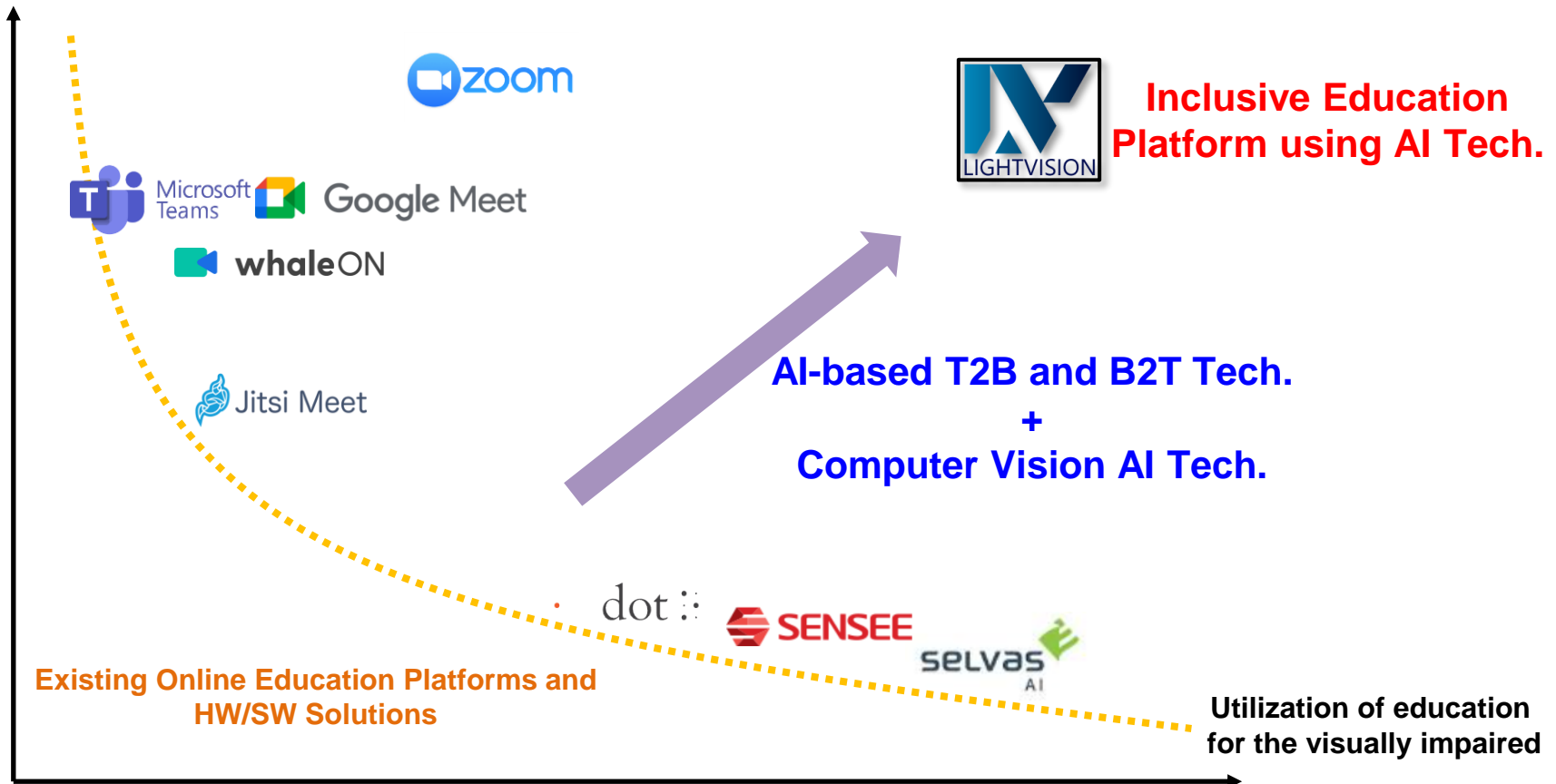
Braille characters for '\$' and '거'
(Braille characters for dollar and '거' are same)

Example Sentences in Braille	Braille Translation Results
	탕수육 소스 부어!
	탕수육 소스 부억에서 가져와라
	\$100 is expensive.
	거미는 절지동물이다.

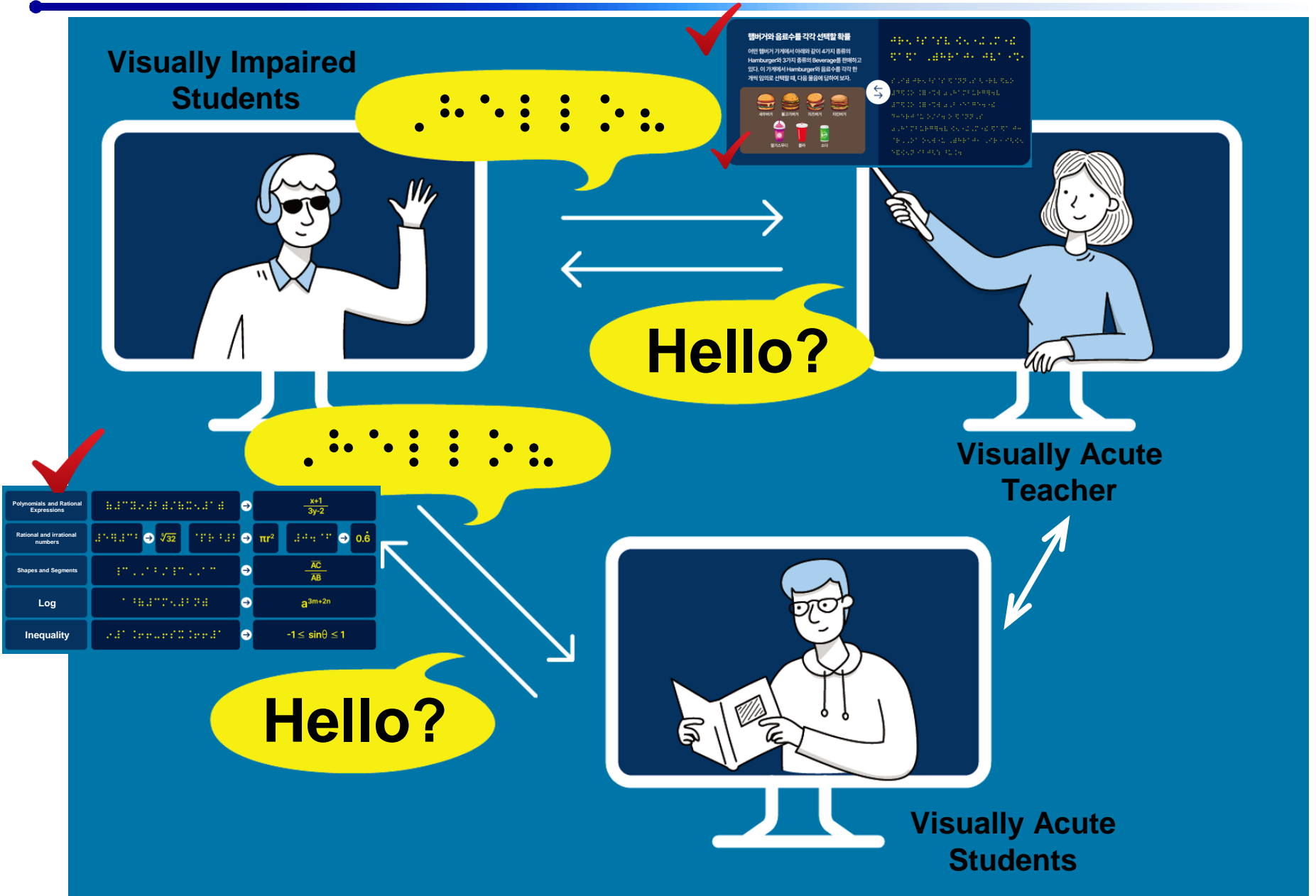
Positioning Map of Online Education Platform

Online education platform that provides T2B and B2T services that can be used by both visually impaired and visually acute people

Utilization of online education



Online Education Diagram for Inclusive Education



Video Demo for Implemented Service (including AI-based B2T translation)



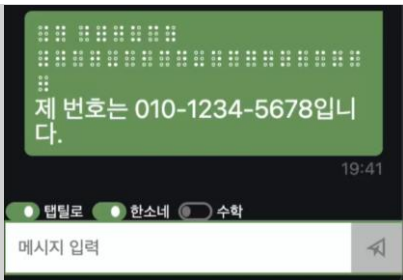
1. 'Korean' B2T translation
(예문: 점자를 사용했던 사람)



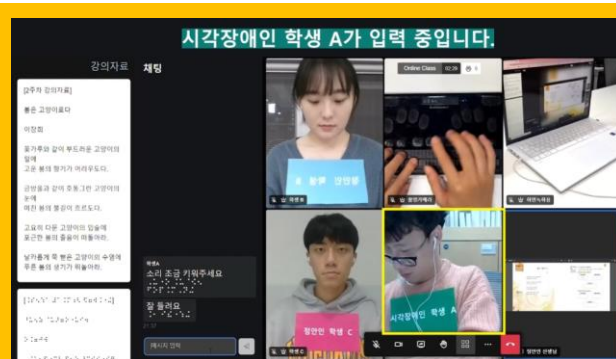
2. 'Korean + Symbol' B2T translation
(예문: 경유는 47%, 휘발유는 25% 올랐네!)



3. 'Korean + Number' B2T translation
(예문: 2013년에는 3학년이었다.)



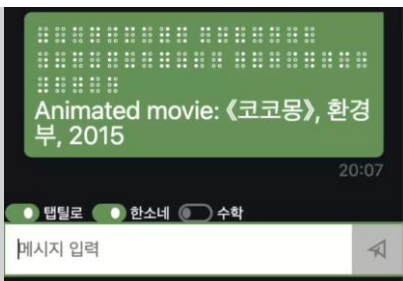
4. 'Korean + Number + Hyphen' B2T translation
(예문: 제 번호는 010-1234-5678입니다.)



Video Demo for Implemented Service



5. 'Korean + English' B2T translation
(예문: 주어진 단어에 er, -or, -ist 중 하나를 붙여봅시다.)



6. 'Korean + English + Number + Symbol' B2T translation
(예문: Animated movie: <코코몽>, 환경부, 2015)

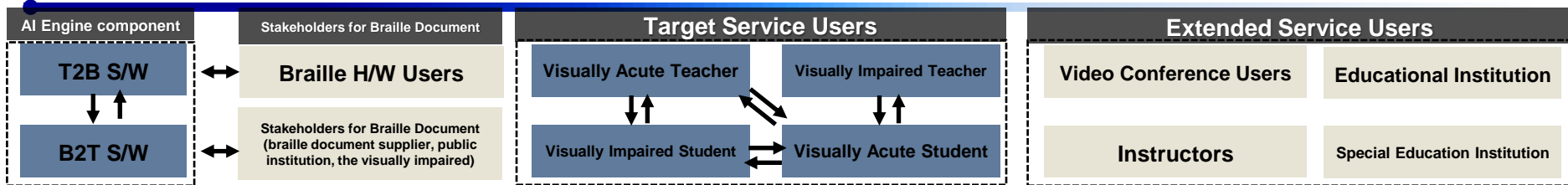


7. 'Korean + Scientific Symbol' B2T translation
(예문: 취장 β세포)



8. 'Math Symbol' B2T translation
(예문: 5m²)

Service Model Diagram



ELP (Easy Learning Platform for everyone) Feature Layer

- 1. Sharing Braille Lecture Materials for the Visually Impaired:** Displays Braille text and images of food items.
- 2. T2B and B2T Chat for the Visually Impaired:** Shows a chat interface with mathematical equations like $\frac{1}{4} \times \frac{2}{3} = \frac{1}{6}$.
- 3. Automatic Attendance:** Shows a student's face being recognized and labeled with a name like '홍석재크 완료'.
- 4. Check Students' Responsiveness via Facial Attribute Recognition:** Shows a grid of student faces with various facial attributes highlighted.
- 5. Matching Face, Name, Voice, and Chat:** Shows a video conference interface with a chat window and a 'Face Matching' overlay.
- 6. Grouping Students with Degree of Focus + Cheating Prevention:** Shows a grid of student faces grouped into categories like '수업 집중도가 가장 높은 학생들 Grouping'.
- 7. Platform for Realtime Popular Courses:** Shows a list of courses with ratings and enrollment numbers.

Technology Layer

- 1. AI-based T2B and B2T engine for Math and Science:** Shows mathematical formulas like $x+1$, $3y-2$, $\sqrt{2}$, π^2 , 0.6 , $\frac{AC}{AB}$, a^{3m+2n} , and $-1 \leq \sin \theta \leq 1$.
- 2. Face Recognition:** Shows faces of Sangji Lee and Moonsoo Ra with facial landmarks.
- 3. Facial Attribute Recognition:** Shows faces with various attributes like '10대 여자 보편형' and '10대 여자 기쁨'.
- 4. Identification Matching Technology:** Shows a 'Face Matching' and 'Name Matching' interface with a chat window.
- 5. Eye Gaze Tracking and Object Detection:** Shows a face with red dots indicating gaze points and a hand holding a tablet.
- 6. Virtual School for Instructors:** Shows a virtual school interface with course cards like 'A과목 무엇인가?', '심리학', '외국어', '교양', '성찰속의 예술', '금융/경제', '동일동선생님 강의', '문학에서 삶을 찾자', '교양은 교양', '교양인의 마음'.

Dataset Layer

Middle School Curriculum Dataset			Language Dataset				High School Curriculum or Professional Contents Dataset	Face and Object Recognition Dataset		
Math Textbook	Science Textbook	English Textbook	Korean	English	Korean + English		High School Curriculum	Face	Cellphone	Instrument
Korean Conversation Corpus	Korea-English Translation Corpus	Medical Textbook	Russian	Japanese	Chinese	Spanish	Medical Jargons	Tablet	Notebook	

응용 문제

응용 문제

- 용수철을 처음 길이에서 x m 늘이는 데 필요한 힘의 크기를 $f(x)N$ 이라고 하면 이때 한 일의 양 W J은 $W = \int_0^x f(t) dt$ 이다. 처음 길이가 0.2 m 인 용수철을 x m 늘이는 데 필요한 힘의 크기가 $200xN$ 일 때, 이 용수철을 0.4m 가 될 때까지 늘이는 데 한 일의 양을 구하라
- 양의 실수 전체의 집합에서 정의된 함수 $f(x)$ 가 $\frac{f(x)}{21x} \leq f(x) \leq \frac{21x}{21x}$ 를 만족시킬 때, $\lim_{x \rightarrow \infty} \frac{f(x)}{x}$ 의 값은?

① $\frac{1}{21}$ ② 1 ③ $\frac{1}{21x}$ ④ 2 ⑤ $\frac{1}{21}$
- n 이 자연수일 때, x 에 대한 이차방정식 $x^2 + 11x - n(n+1) = 0$ 의 두 근을 α_n, β_n 이라고 하자. 이때 $\sum_{n=1}^{\infty} (\frac{1}{\alpha_n} + \frac{1}{\beta_n})$ 의 값을 구하라

