KT’s response to COVID-19

Leverage telecommunications data and AI to tackle pandemics
Korea’s response to COVID-19 leveraging ICT

Korea has distributed a policy paper regarding sharing its experience and knowledge to tackle COVID-19 using ICT in response to the request from global countries and international organizations.

Epidemic Disease Transmission and Response Process

1. Digital Tracing
   - International Mobility Tracing
   - Domestic Mobility Tracing

2. Monitoring & Prediction
   - Outbreak Monitoring/Assessment
   - Self-check & Screening
   - Isolation monitoring
   - Spread prediction, Policy making

3. Testing
   - X-ray imaging AI diagnosis
GEPP - ① International Mobility Tracing

Roaming-driven data analysis allows a national health authority to identify the movement of those who traveled disease-prone countries and to send SMS alerts to improve the travelers’ risk awareness.

<table>
<thead>
<tr>
<th>Mobile Operator</th>
<th>Departure Information</th>
<th>Arrival Information</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Departure Date</td>
<td>Arrival Date</td>
</tr>
<tr>
<td></td>
<td>Visited countries</td>
<td>Visited countries</td>
</tr>
<tr>
<td></td>
<td>Name, Date of birth</td>
<td>Name, Date of Birth</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Travelers to disease-prone countries</th>
<th>Visit</th>
<th>Return</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SMS</td>
<td>SMS</td>
</tr>
<tr>
<td>EBOLA</td>
<td>SMS</td>
<td>SMS</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Health Authority (CDC)</th>
<th>Infectious country information</th>
<th>Infectious disease information</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Preventing infectious disease</td>
<td>Reporting channels</td>
</tr>
</tbody>
</table>

Real-time Monitoring

Global outbreak status

Entry from disease-prone countries
GEPP - ② Domestic Mobility Tracing

Domestic Mobility Tracing assists to prevent further spread of the virus by supporting prompt quarantine. This implies strengthening the government’s capability to respond to the infectious disease.

**Tracing of Confirmed Cases**

- Identify a pathway of the confirmed cases using their nearest mobile base station by contact time.
- Identify suspects who stayed near the confirmed cases.

**Contact Tracing**

<table>
<thead>
<tr>
<th>Radius</th>
<th>Number of Base Station</th>
<th>Number of People (+1hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100M</td>
<td>4</td>
<td>582</td>
</tr>
<tr>
<td>200M</td>
<td>36</td>
<td>3,481</td>
</tr>
</tbody>
</table>

**Government Response**

- Through the information, the national health authority and municipalities can conduct prompt investigation and quarantine the area.
- Sharing the info. with the public

- SMS alert is sent to those who live or visit nearby.
GEPP Performance in Korea

- **Entry of virus in Korea**
  - **MERS Outbreak**
    - 2015
  - **GEPP launch (KCDC* – KT)**
    - 2016
  - **Domestic Mobility Tracing**
    - (Tracing of confirmed cases & contacts)
    - 2017
  - **MERS Re-outbreak**
    - 2018
  - **COVID-19**
    - 2019
    - 2020

**International Mobility Tracing**
- (SMS Alert/Real-time Monitoring)

**Response Performance**

<table>
<thead>
<tr>
<th>Year</th>
<th>MERS</th>
<th>COVID-19</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2016</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td>Confirmed case 1, Death 0</td>
<td>Flattened the curve of COVID-19</td>
</tr>
<tr>
<td>2018</td>
<td>2018 (GEPP)</td>
<td>2020 (GEPP)</td>
</tr>
<tr>
<td>2019</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2020</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Quarantine Capacity**

<table>
<thead>
<tr>
<th>Year</th>
<th>Risk Awareness</th>
<th>Quarantine Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2016</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td>Self-Reporting 47% ↑</td>
<td>36.5% → 90.4%</td>
</tr>
<tr>
<td>2018</td>
<td>1,248 cases ('17)</td>
<td>('17)</td>
</tr>
<tr>
<td>2019</td>
<td>850 cases ('16)</td>
<td>('19)</td>
</tr>
</tbody>
</table>

* KCDC: Korea Center for Disease Control and Prevention
KT is leading the initiative to connect ICT to promote global health security.
GEPP : Bigdata and AI driven platform (2018~)
Monitoring & Prediction and Testing functions are to be ready for Post-COVID-19 and future pandemics.

Epidemic Disease Transmission and Response Process

Abroad
Entry of epidemics
Transmission inside of the country

1. Digital Tracing
   - International Mobility Tracing
   - Domestic Mobility Tracing

2. Monitoring & Prediction
   - Outbreak Monitoring/Assessment
   - Self-check & Screening
   - Isolation monitoring
   - Spread prediction, Policy making

3. Testing
   - X-ray imaging AI diagnosis

GEPP : Bigdata and AI driven platform (2018~)
Monitoring & Prediction and Testing functions are to be ready for Post-COVID-19 and future pandemics.
The MRC-based analysis of infectious disease information generated by the media and social networking sites around the world automatically evaluates the risks by region and disease. Combined with roaming data, it is possible to derive the possibility of a certain disease entering the country.

### Extracting info on infectious diseases through AI technology from the media and SNS

- **Data Crawling**
  - Data Source: ProMED, GPHIN, BBC, WHO, etc.
  - 46 Websites for relevant data collection

- **Classification**

- **Evaluation**

- **Machine Learning (MRC)**

### Arrival information using roaming data

- Statistics of arrivals by foreign countries

### Outbreak Monitoring & Assessment

- Global Outbreak Status
  - What kind?
  - When?
  - Where?
  - How it occurred?

### The possibility of global epidemics inflow to home country

**COVID-19 Entry possibility**: 72%
Self-check the target of the screening by comparing the confirmed patient's movements with a person's past movements. With symptoms combined, it ultimately provides a service that predicts the probability of infection at individual level.

**Step 1**  
**Infection risk check based on the pathway of confirmed cases**

Create the pathway of confirmed cases based on GPS and Base station  
Check the virus contact history by comparing with the pathway of confirmed cases  
Expected outcome

*Source: Luca Ferretti, Quantifying SARS-CoV-2 Transmission Suggest Epidemic control with digital contact tracing, 31 March 2020, Science*

**Step 2**  
**Mobile App-based infection risk analysis**

Variable  
Input data  
App (Input symptoms)  
IoT Sensing  
Type of population  
Infant  
Child  
Adult  
Elderly  
Virus contact history based on the pathway of confirmed cases  
A.I Modeling  
Diagnosis result

Flu possibility? 72%
## Spread Prediction and Policy Monitoring

The platform predicts the inflow and spread of infectious diseases using population moving pattern from KT’s data, and measure the change in behavior patterns caused by quarantine policies such as social distancing. With this operational principle, it measure the effects and predicts the future spread.

### AI & Analytics

<table>
<thead>
<tr>
<th>COVID-19 inflow to Risk calculation modeling</th>
<th>KT roaming data</th>
<th>Global epidemics</th>
<th>News</th>
<th>AI model development</th>
</tr>
</thead>
</table>

### Output

<table>
<thead>
<tr>
<th>Disease Inflow Prediction Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-country spread Prediction Model</td>
</tr>
<tr>
<td>Policy effect Prediction Model</td>
</tr>
<tr>
<td>Policy effect Evaluation model</td>
</tr>
</tbody>
</table>

### Application

- Inform diseases of citizens by week
- Quarantinable country selection
- Self-Diagnosis
- Medical resource distribution
- Pre-policy ripple effect prediction (ex. schooling)
- Post-policy effect evaluation (ex. Social Distancing)
Testing

In collaboration with an AI company, KT expands GEPP to early detection and diagnosis

X-raying imaging AI diagnosis → Assist in triaging patients
Response to epidemics from NPI* perspective
ICT will contribute as a key element of the NPI to respond to emerging infectious diseases such as COVID-19.

Prevention of infectious disease and Response

Pharmaceutical Intervention **
- Vaccine
- Medicines

Non-pharmaceutical Intervention
- GEPP
- Coughing with covering
- Washing hands
- Wearing mask
- No gatherings
- Social distancing

*NPI(Non-pharmaceutical Intervention) **PI(Pharmaceutical Intervention)
**Way forward**

**Section I. Areas of Collaboration**

“Facilitating actions for each to contribute to development challenges that impede poverty reduction leveraging ICT-based approach such as the use of Bigdata and AI.”

Feb 2020