

Paper for a special issue of AI & Society on:

“Exploring Civic Intelligence: Descriptions & Prescriptions”.

TITLE:

**Multilingual Disaster Information System:
Information Delivery Using Graphic Text for Mobile Phones**

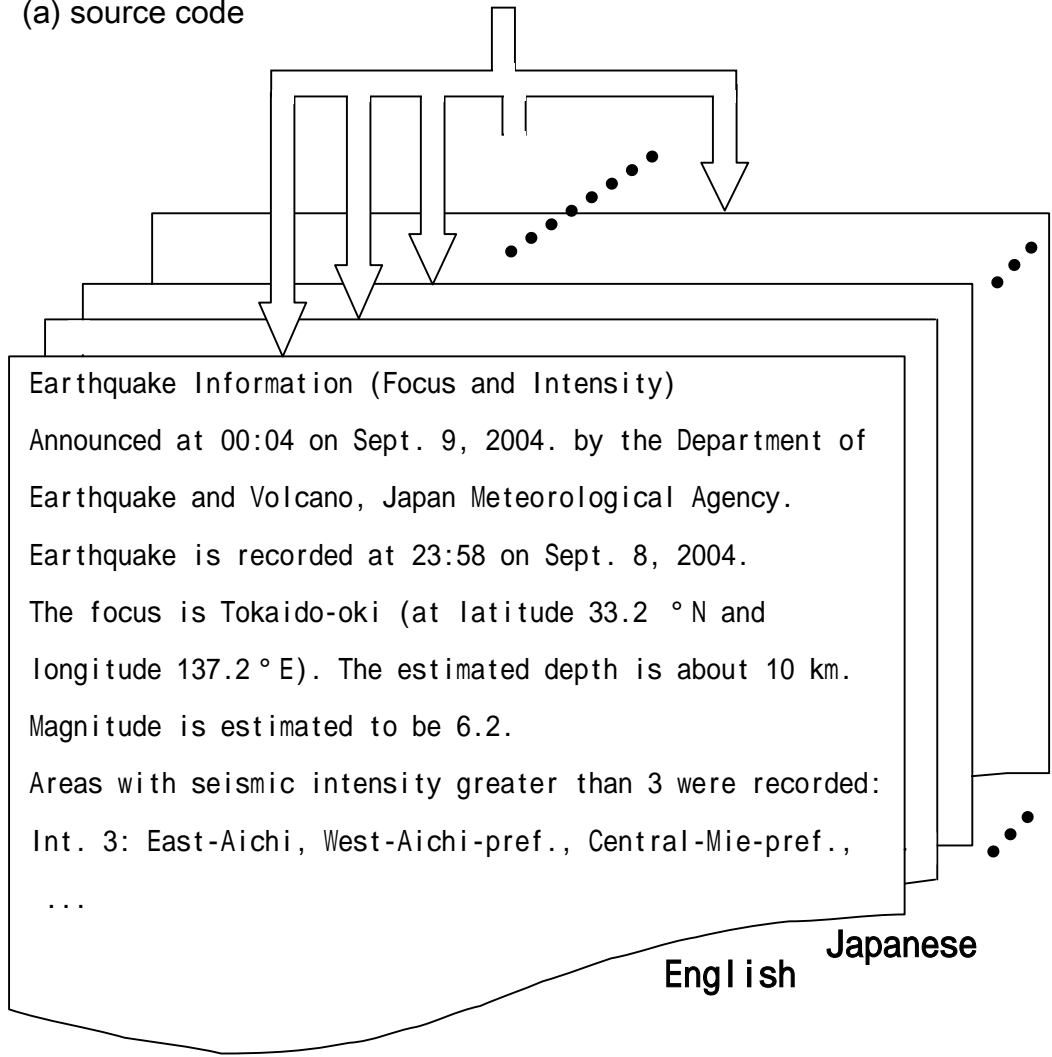
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Figures in the paper:

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84 03 00 040904000452 C11 0409082358 488 /// // /// 0332 01372
010 62 EI // BI S3 450 451 461 ...
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(a) source code



(b) Multilingual Information

Fig. 1 An example of disaster information. (a) Part of a telegraphic message announced immediately after an earthquake by the Japan Meteorological Agency (JMA). (b) Sentences we generated from the source code according to the protocol previously published by JMA. Once multilingual templates are prepared, disaster information text in English, Japanese, Chinese and other languages can be generated immediately and simultaneously from the telegram code.

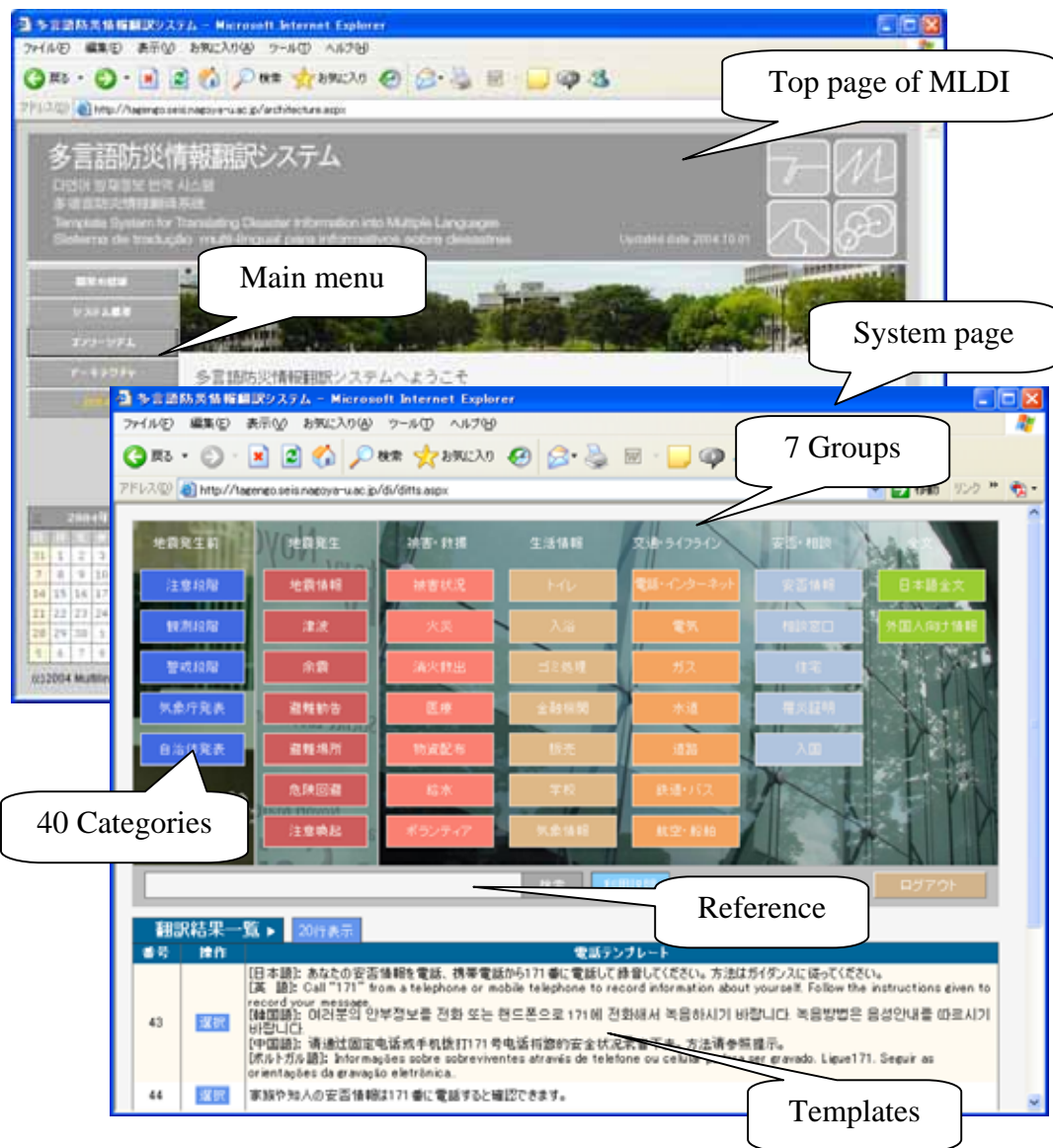


Fig. 2 The top page and the system page of Multilingual Disaster Information system (MLDI). Template sentences in the category selected from 40 categories in 7 groups are displayed in the lower part of the system page. Japanese, English, Korean, Chinese and Portuguese templates are shown. Once a user fills in blanks in the Japanese template in the edit mode and pushes the translation button, translated sentences will be displayed in 5 languages.

	Japanese	English	Korean	Chinese	Portuguese
No.	日本語	英語	韓国語	中国語	ポルトガル語
選択 58	国際電話もできる電話が名大(Nagoya Univ.)地点に約5カ所設置されています。	Telephones that can be used for international calls are set up in about 5 locations at location 名大(Nagoya Univ.).	국제전화를 걸 수 있는 전화가 名大(Nagoya Univ.)지점에 약 5개소 설치되었습니다.	在名大(Nagoya Univ.)地点共设置了大约5处可以拨打国际电话的电话机。	No local 名大(Nagoya Univ.), está instalado 5 telefones internacionais.
選択 61	救急車、その他消防署への用事の場合は、119へ電話してください。	Call "119" for ambulance or fire station.	구급차 혹은 소방서에 용건이 있을 경우에는 119로 전화하시기 바랍니다.	请拨打119联系救护车及消防署。	Para contactar ambulância ou corpo de bombeiro ligue para 119.
選択 115	給水場所は次の地点です。(本山(Motoyama), 八事(Yagoto))	Water is supplied at the following locations. (本山(Motoyama), 八事(Yagoto))	급수장소는 다음과 같습니다.(本山(Motoyama), 八事(Yagoto))	供水地点在如下地点。本山(Motoyama), 八事(Yagoto)	A água potavel está sendo oferecida no local a seguir 本山(Motoyama), 八事(Yagoto).
選択 19	海岸の近くにいる方は、今後の津波情報にご注意ください。	People near the coast should continue to be mindful of tidal wave reports.	해안근처에 계신 분은 계속되는 해일정보에 주의하시기 바랍니다.	住在海岸附近的人请随时注意今后的海啸警报。	Para as pessoas que estão próximos ao mar, favor estar atento às informações sobre maremoto.
選択 200	垂れ下がった電線や電柱などは大変危険ですので絶対に触れないで下さい。	Electric poles or wires that are hanging down are extremely dangerous. DO NOT touch.	떨어진 전선이나 전봇대는 대단히 위험하므로 절대 손대지 마십시오.	掉下(垂下)的电线, 电线杆非常危险, 请绝对不要触摸。	Não tocar nos fios soltos e postes de eletricidade, pois é muito perigoso.

Fig. 3 Examples of output of MLDI. Japanese, English, Korean, Chinese and Portuguese sentences are shown. Blanks in the template are filled with the name of a location in Japanese and roman letters inside the parentheses in this figure.

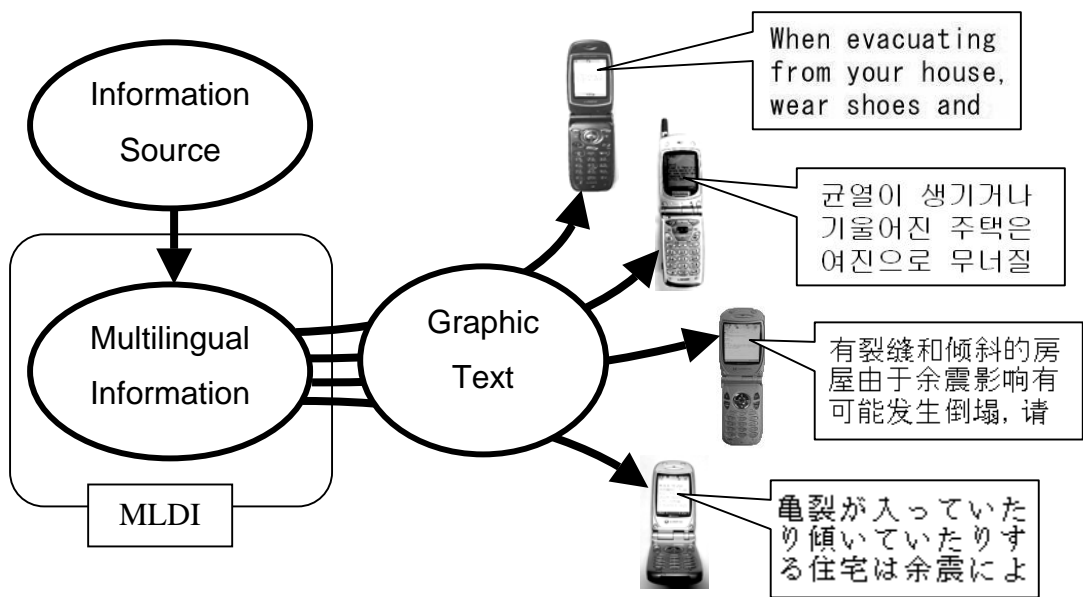


Fig. 4 Delivery of multilingual disaster information using graphic text for mobile phones. Multilingual phrases generated by MLDI can be sent to mobile phones as graphic text attached in an e-mail.

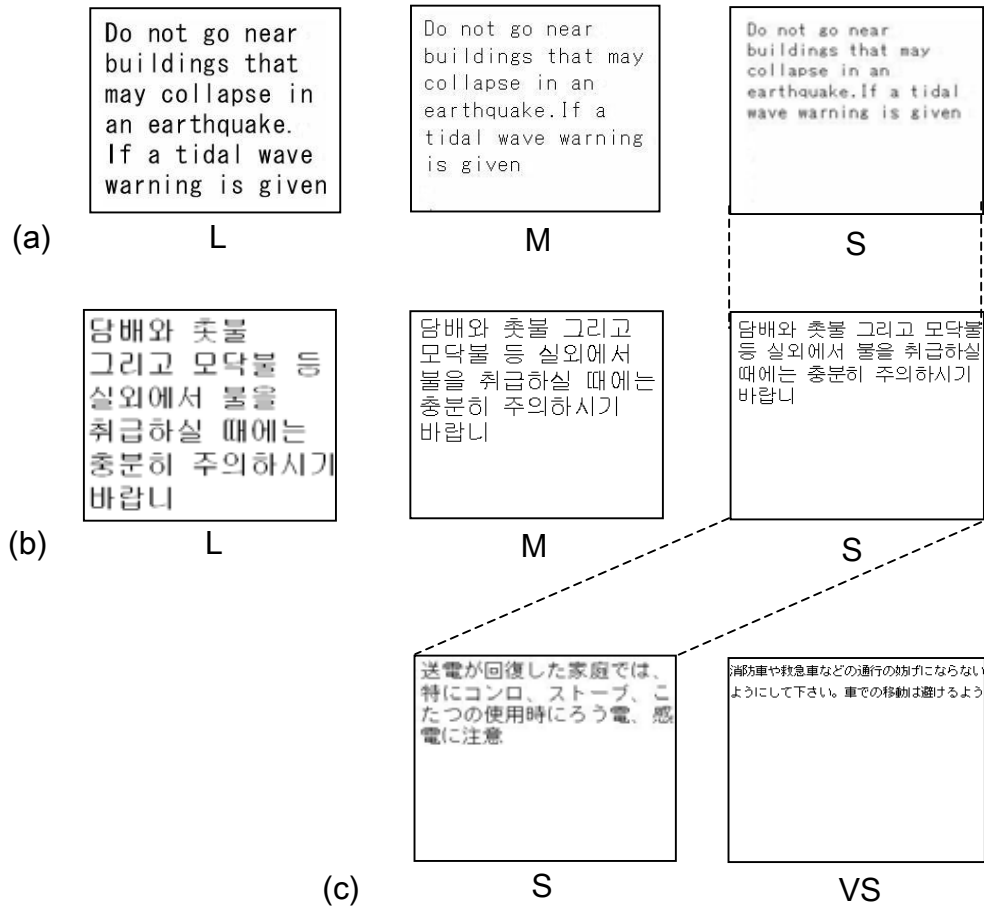
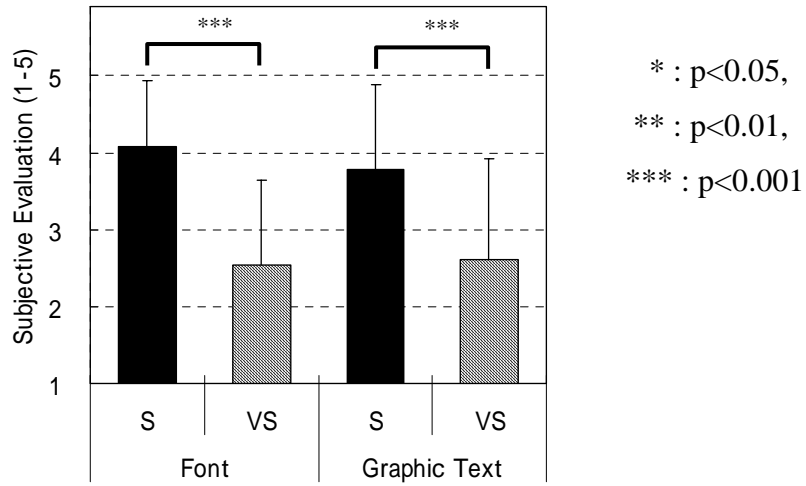
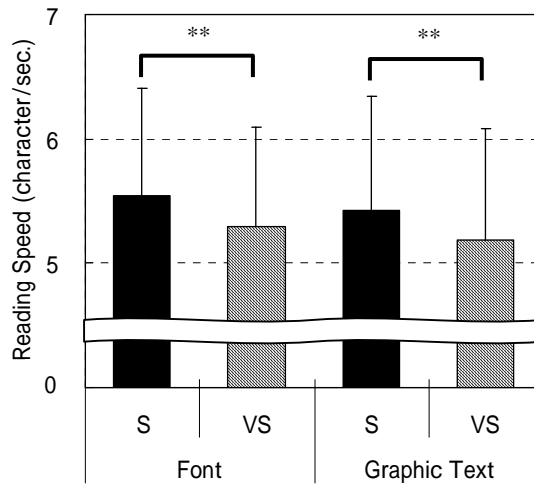


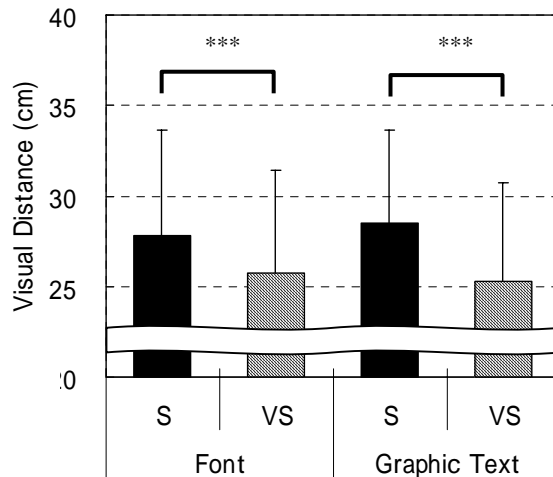
Fig. 5 Examples of graphic text used in visibility assessment experiment. Short sentences are presented in the JPEG format. The width of these images are the same as the resolutions of each mobile phone used in the experiments. (a) English, (b) Korean and (c) Japanese are shown. Large (L): maximum 16 characters/line in English, 8 characters/line in Japanese, Chinese and Korean. Medium (M): 20 and 10 characters/line in English and other languages, respectively. Small (S): 24, 12 (same as above). Very Small (VS): 20 characters/line in Japanese.



(a) Subjective Evaluation



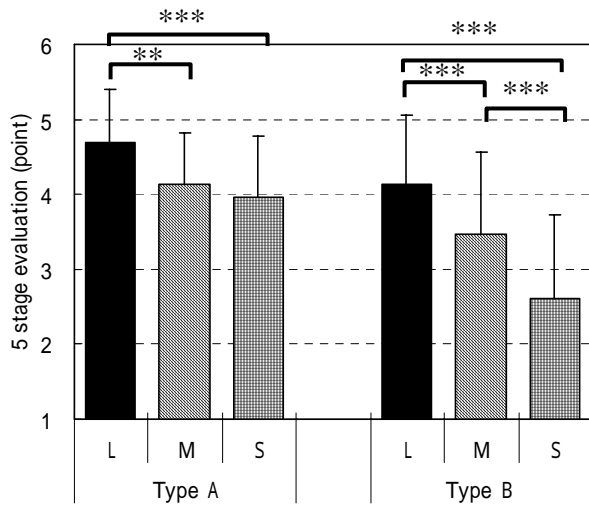
(b) Reading Speed



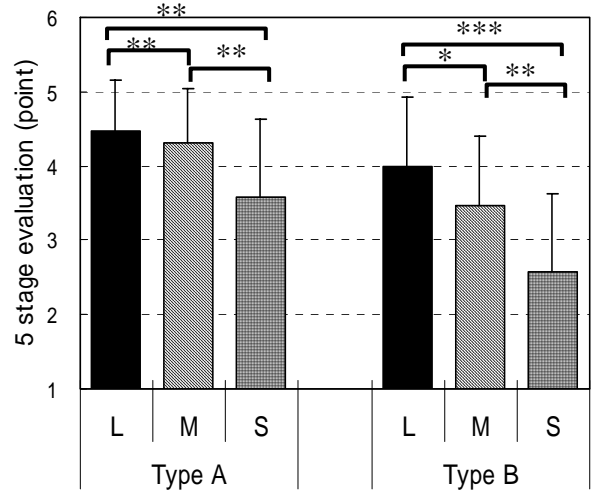
(c) Visual Distance

Fig. 6 Comparisons of visibility of graphic text with font. Japanese phrases of small (S) or very small (VS) characters were displayed by both built-in font and graphic characters on the mobile phones of Type A (in Table 1), and (a) subjective evaluation, (b) reading speed and (c) visual distance were recorded.

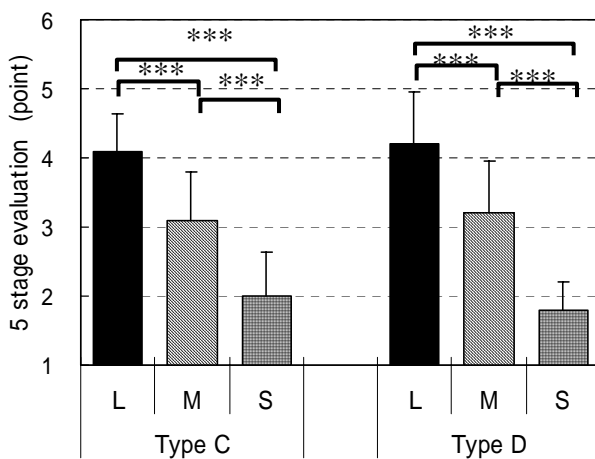
* : $p < 0.05$, ** : $p < 0.01$, *** : $p < 0.001$



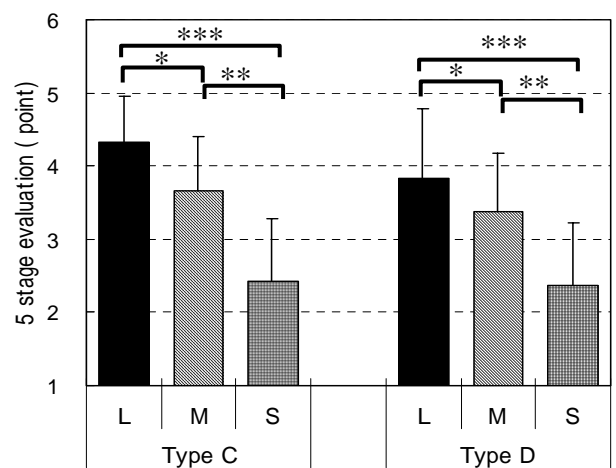
(a) English



(b) Korean



(c) Chinese



(d) Japanese

Fig. 7 Results of subjective evaluations. Visibility of (a) English, (b) Korean, (c) Chinese and (d) Japanese graphic text of large (L), medium (M) and small (S) characters was evaluated on a five-step scale, using two types of mobile phones, respectively.

Table 1 Types of mobile phones used in the experiments.

Type:	Maker	Product	Size of LCD	LCD specification	Resolution
Type A:	SHARP	SH53	2.4 inch	260 K color CGS	240×320 dot
Type B:	SHARP	SH07	2 inch	260 K color TFT	120×117 dot
Type C:	SANYO	SA51	2.1 inch	260 K color TFT	132×176 dot
Type D:	SANYO	SA03	2 inch	256 colors STN	120×160 dot