



Dialectal Arabic Telephone Speech Corpus: Principles, Tool design, and Transcription Conventions

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PRESENTATION OUTLINE

- ❖ ARABIC LINGUISTIC BACKGROUND
- ❖ ARABIC DIALECTAL SPEECH: METHODOLOGICAL TRANSCRIPTION PRINCIPLES AND TECHNOLOGICAL GOALS OF THE PROJECT
- ❖ *AMADAT*: LDC'S ARABIC MULTI-DIALECTAL TRANSCRIPTION TOOL
- ❖ METALANGUAGE: RT-04 ARABIC TELEPHONE SPEECH TRANSCRIPTION CONVENTIONS
- ❖ BRIEF OVERVIEW OF LEVANTINE ARABIC TRANSCRIPTION GUIDELINES

OUR FOCUS WILL BE ON THE ARABIC DIALECTAL TRANSCRIPTION RATIONALE, THE TECHNOLOGICAL GOALS OF THE PROJECT, THE ANNOTATION TOOL STRUCTURE AND THE LEVANTINE CONVERSATIONAL ARABIC TRANSCRIPTION GUIDELINES

ARABIC LINGUISTIC BACKGROUND

- ❖ **“ARABIC LANGUAGE CONTINUUM” WITH ARABIC DIGLOSSIA**
FUSHA = Modern Standard Arabic (=MSA) + ARABIC DIALECTS
+ INTRALINGUAL CODESWITCHING & CODE-MIXING
- ❖ SIGNIFICANT **LINGUISTIC DISTANCE** BETWEEN MSA & DIALECTS
- ❖ SIGNIFICANT **INTER- LINGUISTIC VARIATION** AMONG DIALECTS
- ❖ SIGNIFICANT **INTRA- LINGUISTIC VARIATION** WITHIN DIALECTS
- ❖ IMPORTANT **COMMON CORE OF MUTUAL INTELLIGIBILITY**
 - **HIGH LEVEL OF FORM AND STRUCTURE SIMILARITY**
 - **COMMON LEXICAL CORE WITH SIGNIFICANT SEMANTIC DIFFERENTIATION**

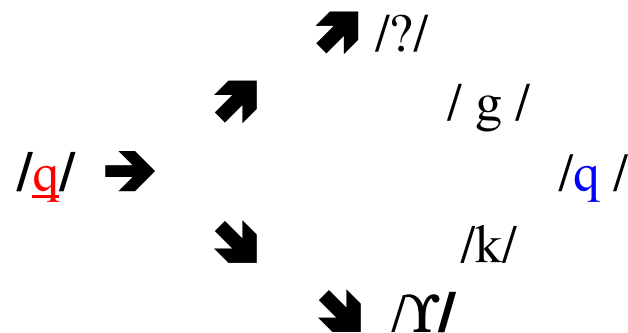
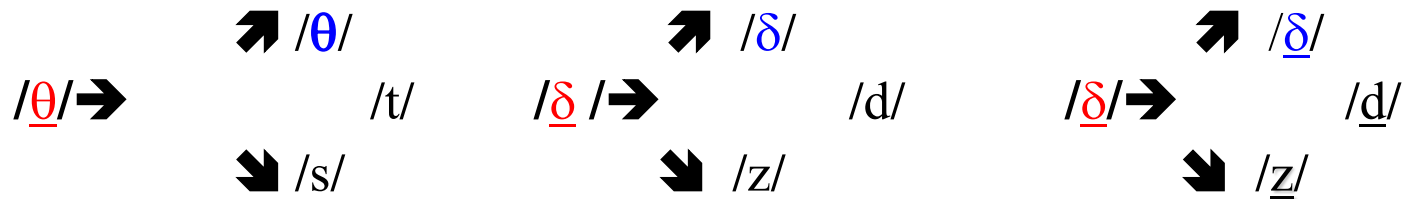
ARABIC LANGUAGE BACKGROUND

- ❖ EXISTENCE OF **LIVING MSA WRITING AND READING COMMUNITY**
- ❖ **INTERNALIZED KNOWLEDGE OF MSA BY EDUCATED AND SEMI-LITERATE NATIVE ARABIC SPEAKERS**
- ❖ EXISTENCE OF **UNDERLYING MSA COGNATE STRUCTURES**
- ❖ USE OF **MSA-BASED “ACCOMMODATION FILTERS”**
- ❖ DOMINANCE OF MSA-BASED GRAPHEMIC TRADITIONS AND EVIDENCE OF MSA-BASED **GRAPHEMIC INTERFERENCE**
- ❖ EXISTENCE OF **STANDARD MSA-BASED GRAPHEMIC KNOWLEDGE**

→ PRODUCTIVE BASE FOR CONVERSATIONAL DIALECTAL ARABIC SPEECH-TO-TEXT TRANSCRIPTION SKILLS

DIALECTAL ARABIC SOUND CHANGE

DIALECTAL SOUND CHANGE PATTERNS



ARABIC DIALECTAL VARIATION

In Egyptian Arabic, MSA /θ/ becomes both /t/ and /s/ while /g / is used to replace / j / and /?/ to replace /q/. In Sudanese Arabic, MSA /q/ is pronounced /g / and [ɣ] while the same phoneme/letter is pronounced /q/, /g/, /?/, and /k/ in Levantine Arabic.

Example: [Iraqi.q.h.C.wav](#)

EXISTENCE AND USE OF ARABIC SCRIPT
“ARCHIGRAPHEMES”

LEVANTINE ARABIC EXAMPLE

Q: شو القصة؟

\$w AlqSp?

"What's the story?"

A/T1: يا زلمي كلتك موكوف مش معتكل وما في كصّة

yA zlmy kltlk mwkwf m\$ mEtkl wmA fy kS~p

A/T2: يا زلمي قانتك موقوف مش معتقل وما فيه قصّة

yA zlmy qltlk mwqwfw m\$ mEtql wmA fy qS~p

"Hey 'dude' I told you arrested not indicted and there is no story"

- ❖ **Need to distinguish the transcription approach from the alphabet used.**
 - ◆ **Transcription approaches: phonic, orthographic, hybrid**
 - ◆ **Alphabets: Arabic, Roman, International Phonetic Alphabet**
 - ◆ **One may perform either phonic or orthographic transcription using either Roman or Arabic alphabets**
- ❖ **Problems with standard approaches**
 - ◆ **Alphabets**
 - IPA is hard to learn
 - Roman script looks and feels unnatural to Arabic speakers
 - Few computer systems fully implement Arabic script and bi-directional input.
 - ◆ **Transcription Approaches**
 - MSA lacks conventions for many Levantine forms, does fully not address needs of acoustic modeling
 - purely phonic approach hinders language modeling

Speech Recognition

❖ Original Speech

❖ Analysis of audio

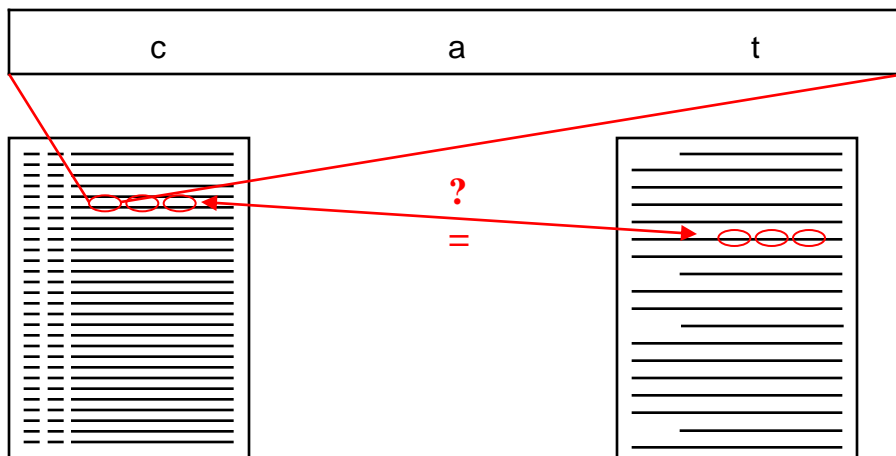
α1	α2	α3	α4	α5	α6	α7	α8	A9
β1	β2	β3	β4	β5	β6	β7	β8	B9
γ1	γ2	γ3	γ4	γ5	γ6	γ7	γ8	γ9
δ1	δ2	δ3	δ4	δ5	δ6	δ7	δ8	δ9

k	e	k
p	i	t
t	a	p

❖ Analysis suggests multiple phonetic interpretations.

❖ Which need to be mapped onto a surface representation

❖ Sequences of which are compared against existing text to determine probable accuracy. Off-domain written text often substitutes for rare on-domain transcripts of spoken language.



LDC CONVERSATIONAL DIALECTAL ARABIC STT RATIONALE

“ How can we harness the native speaker’s knowledge of Arabic orthography conventions and of the MSA linguistic common core to complete a quick, easy, and low-cost Speech-to-Text transcription of Conversational Dialectal Arabic ?”

OBJECTIVES OF SPEECH-TO-TEXT TRANSCRIPTION

- ❖ **FRIENDLY TO WRITERS AND READERS:** EASY TO LEARN TO WRITE AND READ
- ❖ **LEXICALLY CONSISTENT:** A GIVEN UTTERANCE WILL ALWAYS BE SPELLED THE SAME
- ❖ **LEXICALLY DISTINCTIVE:** DIFFERENT UTTERANCES WILL ALWAYS BE SPELLED DIFFERENTLY
- ❖ **ACOUSTICALLY CONSISTENT:** TRANSCRIPTION/SPELLING PREDICTS PRONUNCIATION

CONVERSATIONAL DIALECTAL ARABIC TRANSCRIPTION CHALLENGES

MSA-BASED/ARABIC ORTHOGRAPHIC SCRIPT- BASED TRANSCRIPTION

3 MAJOR CHALLENGES

- ❖ RARE EVIDENCE OF CONVERSATIONAL DIALECTAL ARABIC TEXT CORPUS WITH STABLE MSA-BASED WRITING CONVENTIONS (POETRY, DRAMA, EPISTOLARY, POLITICAL SPEECHES, WEB & INTERNET CHATROOMS)
- ❖ DANGER OF INCONSISTENT CONVERSATIONAL DIALECTAL ARABIC MSA-BASED TRANSCRIPTION PRACTICES
- ❖ NATIVE LANGUAGE REPRESENTATION: DANGER OF OVER INTERFERENCE OF MSA WRITING CONVENTIONS IN EXISTING CONVERSATIONAL DIALECTAL ARABIC TRANSCRIPTION PRACTICES

CONVERSATIONAL DIALECTAL ARABIC STT TRANSCRIPTION OBJECTIVE

**OBJECTIVE: APPROPRIATE BALANCE BETWEEN THE
TWO TENDENCIES BELOW IN ORDER TO AVOID
NEGATIVE CONSEQUENCES TO THE SPECIFIC
NEEDS OF THE STT SCIENTIFIC RESEARCH
COMMUNITY**

- ◆ **Neither too strict an adherence to the use of MSA-based spelling conventions to reconvert dialectal forms to an unnecessary MSA-representation → WITH HIGHER RECONSTRUCTION RATE OF ‘UNDERLYING’ FORMS**
- ◆ **Nor too close an adherence to finer sound /(allo)phonic/ acoustical utterance representation → LEADING TO AN OUTPUT WITH FINER ACOUSTICAL REPRESENTATION BUT WITH LOWER RATE OF SEMANTIC WORD RECOGNITION**

“*AMADAT*” DESIGN SPECIFICATIONS

- ❖ **ARABIC MULTI-DIALECTAL TRANSCRIPTION AND ANNOTATION TOOL**
- ❖ **TWO TIERS OF TRANSCRIPTION / ANNOTATION**
- ❖ **MODERN STANDARD ARABIC-BASED TRANSCRIPTION (MSAT: ‘*ORTHOGRAPHIC LEVEL*’)**
- ❖ **ARABIC ORTHOGRAPHIC SYSTEM-BASED TRANSLITERATION (AOST: ‘*SURFACE PHONEMIC LEVEL*’)**
- ❖ **THREE MUTUALLY EXCLUSIVE OPERATION MODES**

'AMADAT' STT TRANSCRIPTION MODES

MSAT MODE: QUICK TRANSCRIPTION → 'GREEN AREA'

- ◆ USE OF NORMAL ARABIC KEYBOARD FOR TRANSCRIPTION
- ◆ FIRST PASS WITH MSA-BASED APPLICABLE CONVENTIONS
- ◆ METALANGUAGE ANNOTATION (CTS RT-04 ANNOTATION)
OBJECTIVE: OPTIMIZED OUTPUT FOR LANGUAGE MODELING

AOST MODE: CAREFUL TRANSCRIPTION → 'YELLOW AREA'

- ◆ USE OF LATIN KEYBOARD FOR TRANSLITERATION
- ◆ USE OF MODIFIED TIM BUCKWALTER CODE WITH SOUND VALUES
- ◆ OBJECTIVE: OPTIMIZED OUTPUT FOR ACOUSTIC MODELING

EDIT MODE: ANNOTATION CORRECTION → 'RED AREA'

- ◆ USE OF LATIN KEYBOARD FOR A TOKEN-BY-TOKEN EDITING
- ◆ ACCESS ONLY TO ANNOTATION MANAGEMENT AND QUALITY CONTROL

Annotation File fsa_10161.txt Speaker IDs (A/B)

Begin	End	Track	Transcription in Arabic	Index	Tr
147.92	148.85	A	(إنقطاع) بهم (صحت) (%أه)	98	(%
148.85	150.01	B	(%أه) بالضبط	99	(%
149.80	151.01	A	(ضحك) أما (إنقطاع)	100	(Df
150.43	152.40	B	أما صحيح اللي بأحكيه و إلا لأ (%أه)	101	>m
152.04	153.42	A	(%أه) لأ صح (%أه) (إنقطاع)	102	(%
152.96	154.18	B	(إنقطاع) معلوم معلوم (إنقطاع)	103	(<r

Speech Comment:

MSA Transcription

أما صحيح اللي بأحكيه و إلا لأ (%أه)

Selected Word

Change Word

Annotation Remark

Insert Word

'MSAT' SPECIFICATIONS AND ISSUES

- ❖ MACHINE-READABLE UNVOCALIZED WRITTEN TEXT DATA
- ❖ NO DIACRITICS IN GENERAL. HOWEVER, USE OF SHADDAH AND INITIAL HAMZA NEED TO BE RE-DISCUSSED BY THE SCIENTIFIC COMMUNITY' USERS
- ❖ FOCUS ON **CONSISTENT TRANSCRIPTION OF SAME FORMS**
- ❖ FOCUS ON **IDENTIFICATION OF SPECIFIC DIALECTAL FORMS**
(DEFINITIONAL NEEDS TO BE DISCUSSED)
- ❖ ANCHORING OF SOME DIALECTAL FORMS TO MSA-SIMILAR UTTERANCES AND AN '**UNDERLYING' MSA SEMANTIC STRUCTURE**
(DEFINITIONAL NEEDS TO BE DISCUSSED)
- ❖ CAUTIOUS/CONSERVATIVE USE OF RECONSTRUCTED '**UNDERLYING' FORMS: "NO REVERSE MSA ENGINEERING"**

Annotation File fsa_10161.txt Speaker IDs (A/B)

Begin	End	Track	Transcription in Arabic	Index	Tr
147.52	148.57	A	(صوت) (صوت) (صوت)	98	(S)
148.85	150.01	B	(أه) بالضبط	99	(%)
149.80	151.01	A	(صوت) (صوت) (صوت)	100	(S)

Prev Next Play Stop Bank Drop BadSeg

Speech Comment F1: (breath) F2: (cough) F3: (laugh) F4: (music) F5: (noise) F6: (peopletalk) F7: (sneeze) F8: (silence) F9: (pause)
 F10: (%ah) F11: (%eh) F12: (%um) F13: (%ooh) F14: (%hm) F15: (noise/) F16: (overlap) F17: (overlap/)

Vowelized Arabic Trans

أما صحیح الّلی بحکیّه و إلاّ لنا (%أه)

Linguistic Transliteration

>am~aA SaHiyH Al~ily baHkiy~h wi <il~aA la> (%>h)

Selected Word >am~aA Change Word

Annotation Remark Insert Word

Cons Change Velarized Cons Voc Variant Hamzah Drop Diphthong -h Deletion Cons Deletion -ap Silent -ap Pronounced Delete Word

'AOST' SPECIFICATIONS AND ISSUES

- ❖ FOCUS ON **CLOSE ADHERENCE TO SOUND SPECIFICITIES**
- ❖ FOCUS ON FULL FUNCTIONAL VOCALIZATION WITH SUKUN LIMITED TO SYLLABIC DIVISION WHEN NEEDED FOR PRONUNCIATION
- ❖ NO REPRESENTATION OF VOCALIC QUALITY VARIATION BUT LENGTHENING OF UNDERLYING DIPHTHONGS
- ❖ INCLUSION OF RELEVANT SOUND FEATURES EXCEPT MORPHOPHONEMIC ASSIMILATION PHENOMENA (EXAMPLE: AL-), AND EPENTHETIC AND JUNCTURE PHENOMENA
- ❖ USE OF PERSIAN LETTERS FOR CAREFUL TRANSCRIPTION OF UTTERANCES IN WHICH SOUNDS WHICH DO NOT EXIST IN THE ARABIC ORTHOGRAPHY OCCUR
- ❖ WHILE RECORDING AND ANNOTATING DIALECTAL SOUND FEATURES IN AOST, THE LINKED MSAT TOKENS AND QUICK TRANSCRIPTION BASELINE REMAIN UNCHANGED/STABLE

Annotation File fsa_10161.txt Speaker IDs (A/B)

Begin	End	Track	Transcription in Arabic	Index	Tr
147.92	148.97	A	(إصطاح) بالهم (صمت) (أه)	98	(%)
148.85	150.01	B	بالضبط (أه)	99	(%)
149.80	151.01	A	(أه) (أه) (أه) (أه) (أه)	100	(%)

Speech Comment

Vowelized Arabic Trans

أَمَّا صَحِيحُ الَّذِي بَحْكِيَّهِ وَ إِيَّا لَأَ (%أه)

Linguistic Transliteration

>am~aA SaHiyH Al~ily baHkiy~h wi <il~aA la> (%>h)

Selected Word

Annotation Remark

RT-04 CONVERSATIONAL ARABIC TRANSCRIPTION CONVENTIONS

DISFLUENT SPEECH

- ◆ FILLED PAUSES AND HESITATION SOUNDS
- ◆ PARTIAL WORDS AND RESTARTS
- ◆ CONTRACTED WORDS
- ◆ MISPRONOUNCED WORDS
- ◆ HARD-TO-UNDERSTAND SECTIONS
- ◆ BACKGROUND NOISES
- ◆ SPEAKER-PRODUCED NOISES

LINGUISTIC MARKUP

- ◆ LINGUISTIC CHANGE FEATURES
- ◆ SOCIO-LINGUISTIC VARIATION FEATURES
- ◆ FOREIGN WORDS

MSA-based orthography

“whenever possible, follow the spelling conventions and word segmentation of MSA.” Like this:

قلت لك /ʔultil:ak/

مضبوط /mazbu:T/

مثل /mitl/

مثلا /masalan/

“whenever possible, follow the spelling conventions and word segmentation of MSA.” Avoid this:

ألتاك /?ultil:ak/

مزبوط /mazbu:T/

متل /mitl/

مسلا /masalan/



Exceptions

“Note, however, the following exceptions...”

- 1** list of high-frequency colloquial words
- 2** conjugation paradigms of colloquial verbs
- 3** *nunation* (-an -in -un) is transcribed if heard

Exception 1*High-Frequency Colloquial Words (c. 120)*

عشان	زلمه	بعدين	إيد	إحنا
عم	زي	بكرة	أيش	اللي
فا	شو	بلكي	إيمتى	إمبيرح
فيه	شوي	بينات	أيوه	إنتي
فيش	شوية	جوا	برا	إنتوا
فين	عشان	دغري	بس	أنو

Exception 2

Colloquial Verbs Conjugation Paradigm

هو	يشوف	ما يشوفش	بيجي	ما بيغيش	بيقرى	ما بيقراش
هي	بتشوف	ما بتشوفش	بتيجي	ما بتيغيش	بتقرى	ما بتقراش
هم	يشوفوا	ما يشوفوش	بيجوا	ما بيجوش	بيقروا	ما بيقروش
إنت	بتشوف	ما بتشوفش	بتيجي	ما بتيغيش	بتقرى	ما بتقراش
إنتي	بتشوفي	ما بتشوفيش	بتيجي	ما بتيغيش	بتقري	ما بتقريش
إنتوا	بتشوفوا	ما بتشوفوش	بتيجوا	ما بتيجوش	بتقروا	ما بتقروش
أنا	بشوف	ما بشوفش	بجي	ما بجيش	بقرى	ما بقراش
إحنا	بنشوف	ما بنشوفش	بنيجي	ما بنيغيش	بنقرى	ما بنقراش

Exception 2*Colloquial Verbs Conjugation Paradigm*

ما قرأش	قرى	ما جاش	إجى	ما شافش	شاف	هو
ما قرئش	قرت	ما جئش	إجت	ما شافئش	شافت	هي
ما قرؤش	قروا	ما جؤش	إجوا	ما شافؤش	شافوا	هم
ما قرئتش	قریت	ما جئتش	جیت	ما شفتش	شفت	إنت
ما قرئتیش	قریتی	ما جئتیش	جیتی	ما شفتیش	شفتی	إنتی
ما قرئتوش	قریتوا	ما جیتوش	جیتوا	ما شفتوش	شفتوا	إنتوا
ما قرئتئش	قریت	ما جئتئش	جیت	ما شفتئش	شفت	أنا
ما قریناش	قرینا	ما جیناش	جینا	ما شفناش	شفنا	إحنا

Exception 3

Nunation (tanween) should reflect actual pronunciation

مرحباً /marHaban/

مرحبا /marHaba/

أهلاً وسهلاً /?ahlan wa-sahlan/

أهلا وسهلا /?ahla wa-sahla/

Issues: *Choose the variant with the highest frequency of usage*

45	أنا باحكي	455	أنا بحكي
1,420	أيوا	2,530	أيوه
2,540	برضه	3,180	برضو

Issues:

Transcribe hamza when it is pronounced

ممتاز يا أبو محمد /mumta:z y-abu muHam:ad/

أهلين أبو طارق /?ahle:n ?abu Ta:riq/

أنا والأولاد /?ana wa-liwla:d/

الأب والأولاد /?il-?ab wa-l-?awla:d/

CONCLUSION: Collection Update

[September 19, 2004]

- ❖ **13604 Recruits** (Domestic, International) / **11450 active callers**
- ❖ **2184 calls** completed
- ❖ 1662 are available as of today.
- ❖ **1400 of them have more than 8 minutes** speech.
- ❖ Male-Female ratio among the 2184 calls where the genders of both speakers are available : M M 710 / F F 300 / M F 354 / F M 398
Male to female ratio is: 1086 to 676 = 61.6% to 38.4%

[Note that when calls involve speakers with no gender information, those calls are excluded from the calculations above].

- ❖ **2305 speakers were used for the 2184 calls.** 1251 speakers only appeared in 1 call; 381 appeared in 2 calls; 488 appeared in 3 calls.
[1 times 1251; 2 times 381; 3 times 488; 4 times 117; 5 times 41]

2 hrs EVALUATION SET/2 hrs DEVELOPMENT SET
68 hours + 32 hours TRAINING SET

For more information, go to:

http://www ldc.upenn.edu/Projects/EARS/Arabic/Guidelines_Levantine_MSA.htm







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Figure 1.10: Aerial view of a modern building complex.

Figure 1.11: Aerial view of a modern building complex.

Figure 1.12: Aerial view of a modern building complex.

Figure 1.13: Aerial view of a modern building complex.

Figure 1.14: Aerial view of a modern building complex.

Figure 1.15: Aerial view of a modern building complex.

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Figure 1.39: Aerial view of a modern building complex.

Figure 1.40: Aerial view of a modern building complex.



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Figure 1.1: Aerial view of the building complex.

Figure 1.2: Aerial view of the building complex.

Figure 1.3: Aerial view of the building complex.

Figure 1.4: Aerial view of the building complex.

Figure 1.5: Aerial view of the building complex.

Figure 1.6: Aerial view of the building complex.

Figure 1.7: Aerial view of the building complex.

Figure 1.8: Aerial view of the building complex.

Figure 1.9: Aerial view of the building complex.

Figure 1.10: Aerial view of the building complex.

Figure 1.11: Aerial view of the building complex.

Figure 1.12: Aerial view of the building complex.

Figure 1.13: Aerial view of the building complex.

Figure 1.14: Aerial view of the building complex.

Figure 1.15: Aerial view of the building complex.

Figure 1.16: Aerial view of the building complex.

Figure 1.17: Aerial view of the building complex.

Figure 1.18: Aerial view of the building complex.

Figure 1.19: Aerial view of the building complex.

Figure 1.20: Aerial view of the building complex.

Figure 1.21: Aerial view of the building complex.

Figure 1.22: Aerial view of the building complex.

Figure 1.23: Aerial view of the building complex.

Figure 1.24: Aerial view of the building complex.

Figure 1.25: Aerial view of the building complex.

Figure 1.26: Aerial view of the building complex.

Figure 1.27: Aerial view of the building complex.

Figure 1.28: Aerial view of the building complex.

Figure 1.29: Aerial view of the building complex.

Figure 1.30: Aerial view of the building complex.

