



**TECHNISCHE
UNIVERSITÄT
DRESDEN**

Fakultät Elektrotechnik und Informationstechnik Institut für Akustik und Sprachkommunikation

DATENBASIS IZFP/CWT1937

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1 DATENBASIS

Die Datenbasis enthält Zeitfunktionen und Spektrogramme von 620 Zahnrädern. Die Aufzeichnung erfolgte simultan mit zwei Sensoren (AH und BH).

1.1 VERZEICHNISSTRUKTUR

```
$UASR_HOME/data/izfp/cwt1937 : Wurzelverzeichnis
|- common                      : Gemeinsame Daten und Einstellungen
| |- fea.son                   : Referenzmerkmale (aus Spektrogrammdateien)
| |- fea.tme                   : Referenzmerkmale (aus Signaldateien)
| |- flists                    : Gemeinsame Dateilisten
| |- info                      : Konfigurations- und Definitionsdateien      1)
| |- log.son                   : Referenzergebnisse (CCC-Erkenner)          2)
| '- log.tme                   : Referenzergebnisse (CCC-Erkenner)          3)
|- FEAFUS                       : Spektrogramm-Fusion der Sensoren AH und BH
| |- info                      : Konfigurations- und Definitionsdateien      4)
| |- log.son                   : Referenzergebnisse (HMM- und SVM-Erkenner) 2)
| '- log.tme                   : Referenzergebnisse (HMM- und SVM-Erkenner) 3)
'- volumes                      : Originaldateien IZFP-D
  '- 1937_280802_1             : Datenträger "1937_280802_1"
    |- son                     : Sonagrammdateien (Labview)
    '- tme                     : Signaldateien (Labview)
```

- 1) Konfigurationen für Merkmalsextraktion und -import sowie CCC-Erkenner
- 2) Kreuzvalidierung mit [...] /common/fea.son-Merkmalen
- 3) Kreuzvalidierung mit [...] /common/fea.tme-Merkmalen
- 4) Konfigurationen für für HMM- und SVM-Erkenner

2 DATENVERARBEITUNG

Alle Referenzergebnisse wurden mit folgender Software erhalten:

| Programm | Revision |
|----------|----------|
| UASR | 572 |
| dLabPro | 1458 |

Revisionsdatum: 15.02.2010

2.1 MERKMALANALYSE UND -IMPORT

| Dimension | Aufruf |
|-----------|---|
| 128 | FEA.xtp ana [...] /common/info/feaana.cfg |
| 128 | FEA.xtp imp [...] /common/info/feaimp.cfg |
| 1024 | FEA.xtp ana [...] /common/info/feaana.cfg -Ppfa.dim=1024 -Ppfa.cavg=1 |
| 1024 | FEA.xtp imp [...] /common/info/feaimp.cfg -Ppfa.dim=1024 -Ppfa.cavg=1 |

Die erwarteten Merkmalvektordateien befinden sich in folgenden Verzeichnissen:

| Dimension | Quelle | Verzeichnis |
|-----------|--------|---------------------------------|
| 128 | tme | [...] /common/fea.tme/lmag_128 |
| 128 | son | [...] /common/fea.son/lmag_128 |
| 1024 | tme | [...] /common/log.tme/lmag_1024 |
| 1024 | son | [...] /common/log.son/lmag_1024 |

2.2 FUSION DER SONAGRAMME VON SENSOR AH UND BH

| Dimension | Aufruf |
|-----------|---|
| 256 | DB.xtp feafus [...] /common/info/feaana.cfg |
| 256 | DB.xtp feafus [...] /common/info/feaimp.cfg |

Die erwarteten Merkmalvektordateien befinden sich in folgenden Verzeichnissen:

| Dimension | Quelle | Verzeichnis |
|-----------|--------|-------------------------------|
| 256 | tme | [...]/common/fea.tme/lmag_256 |
| 256 | son | [...]/common/fea.son/lmag_256 |

2.3 MUSTERERKENNUNG

Alle Mustererkenner werden in einer Kreuzvalidierung trainiert und getestet.

| Typ | Aufruf | Merkmale |
|-----|---------------------------------------|-----------|
| CCC | XVL.xtp ccc [...]/common/info/ccc.cfg | lmag_1024 |
| HMM | XVL.xtp hmm [...]/FEAFUS/info/hmm.cfg | lmag_256 |
| SVM | XVL.xtp svm [...]/FEAFUS/info/svm.cfg | lmag_256 |

2.3.1 CCC-Erkenner

Die erwarteten Ergebnisse befinden sich in den folgenden Dateien:

| Typ | Merkmal-Quelle | Verzeichnis |
|-----|----------------|--------------------------------|
| CCC | tme | [...]/common/log.tme/ccc-*.dn3 |
| CCC | son | [...]/common/log.son/ccc-*.dn3 |

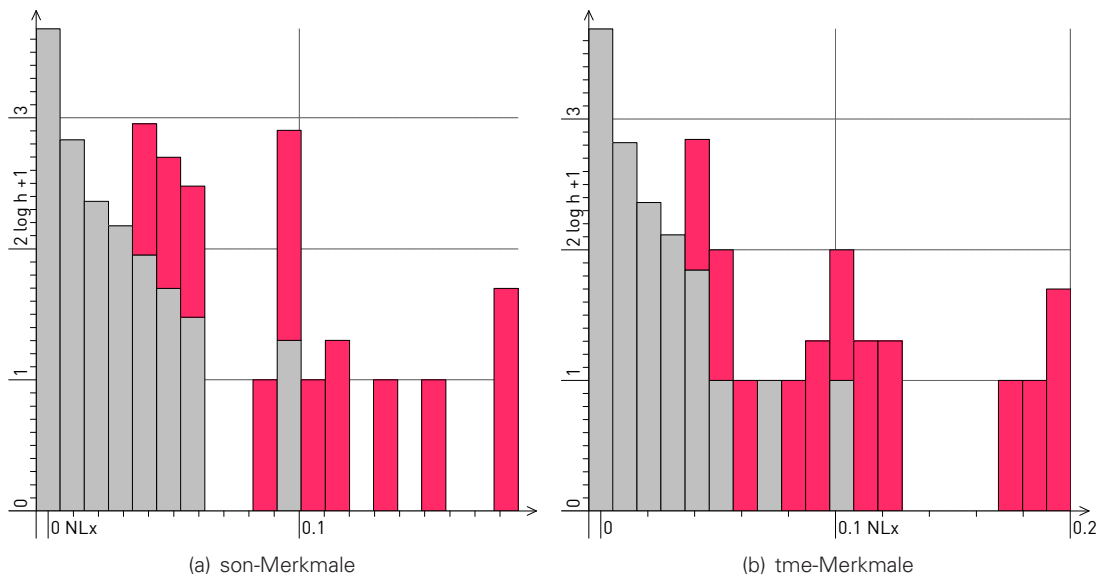


Abbildung 2.1: Referenzergenis CCC-Klassifikator (common/log/ccc-_asses-hist_0K.dn3)

2.3.2 HMM-Erkenner

Die erwarteten Ergebnisse befinden sich in den folgenden Dateien:

| Typ | Merkmal-Quelle | Verzeichnis |
|-----|----------------|--------------------------------|
| HMM | tme | [...]/FEAFUS/log.tme/hmm-*.dn3 |
| HMM | son | [...]/FEAFUS/log.son/hmm-*.dn3 |

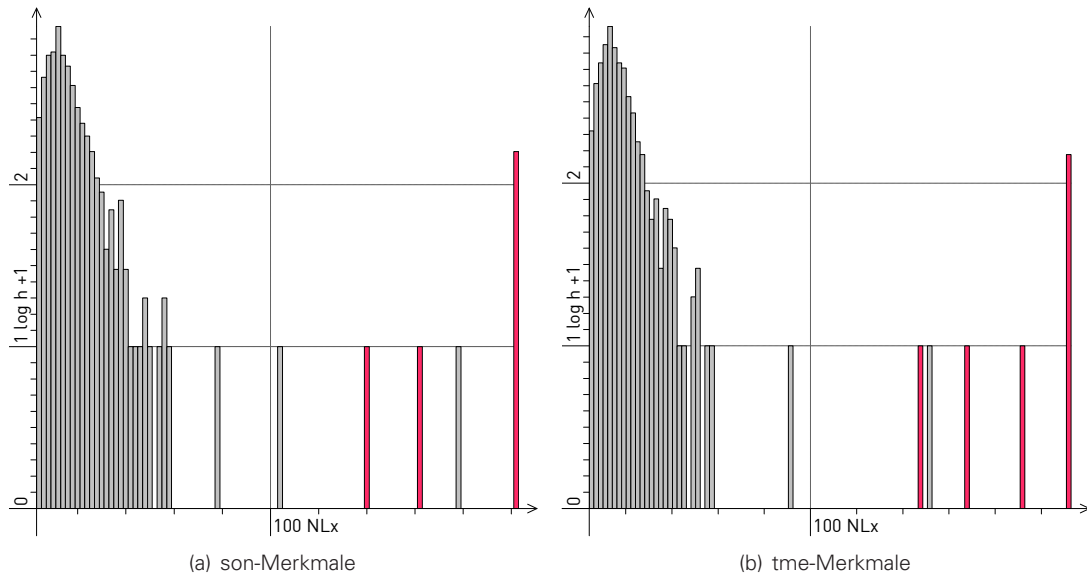


Abbildung 2.2: Referenzergenis HMM-Klassifikator (FEAFUS/log/hmm-2_4_assses-hist_OK.dn3)

2.3.3 SVM-Erkennen

Die erwarteten Ergebnisse befinden sich in den folgenden Dateien:

| Typ | Merkmal-Quelle | Verzeichnis |
|-----|----------------|--------------------------------|
| SVM | tme | [...]/FEAFUS/log.tme/svm-*.dn3 |
| SVM | son | [...]/FEAFUS/log.son/svm-*.dn3 |

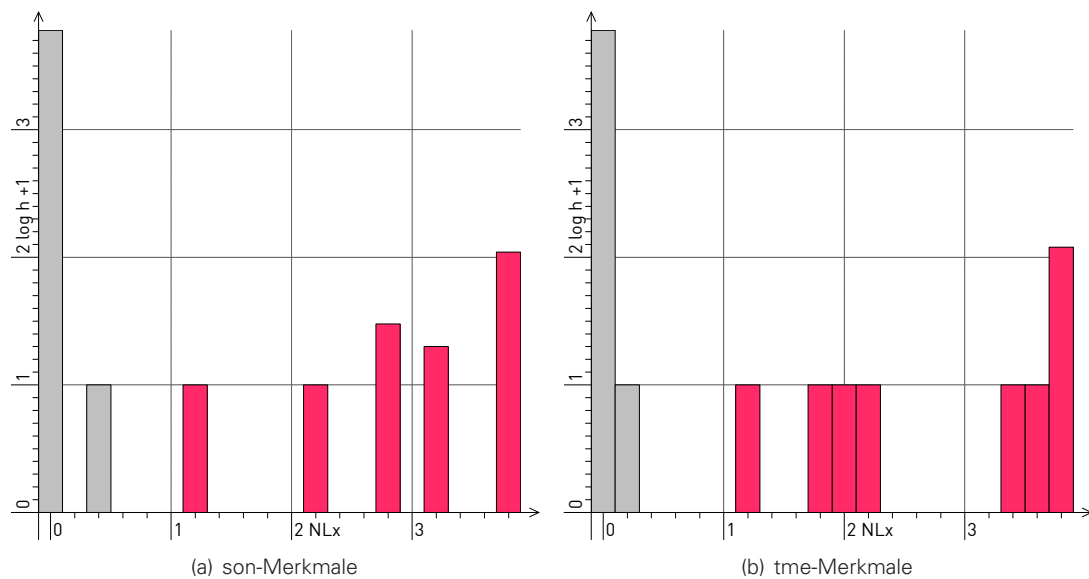


Abbildung 2.3: Referenzergenis SVM-Klassifikator (FEAFUS/log/svm-_assses-hist_0K.dn3)

3 LISTINGS

3.1 UASR-ANPASSUNGSSKRIPTS

3.1.1 [...] /common/info/cwt1937.itp

```
## Unified Approach to Speech Synthesis and Recognition
## - IZFP-D Gear Wheels Thale Database (Recording 1937)
##
## AUTHOR : Matthias Wolff, Constanze Tschöpe
## PACKAGE: uasr/scripts/dlabpro/db/izfp
##

## DB.xtp help function
"._CMD_DB_help" "function" ?instance if
/disarm -CMD_DB_help
{
    "\n\n -----" -MSG; # Very helpful ...
    "\n DB.xtp feafus <cfgfile>" -MSG; # |
    "\n Makes supervectors from the features of sensors AH and BH" -MSG; # |
    "\n OPTIONS:" -MSG; # |
    "\n -P<key>=<value> set/overwrite configuration key" -MSG; # |
    "\n\n -----" -MSG; #
}
end

## Extension to DB.xtp
function -CMD_DB_feafus()
{
    "\n\n// DATABASE MAINTENANCE COMMAND 'feafus'" -MSG;
    data idFeaAh; # Protocol
    data idFeaBh; # Features of sensor AH
    data idLab; # Features of sensor BH
    data idLab; # Labels
    file iF; ( "fea" "" -CFG_get_path ) iF -set path; # Input feature file path
    ( "fea.ext" "dn3" "S" -CFG_get_ex ) iF -set ext; # Feature file extension
    ( "all" "" -CFG_get_flist ) iF -set flist; # File list (all files)
    var sPfa; ( "pfa" "" -CFG_get ) sPfa -sset;
    var nDim; ( "pfa.dim" 0 -CFG_get ) nDim -vset;
    var sDout;
    ( iF.path "?${sPfa}_${nDim}?${sPfa}_${2*nDim}" "replace" -VAR_strop ) sDout =;

    "\n - Output dir : ${sDout}" -MSG; # Protocol
    "\n\n Fusioning ${iF.len} feature files ..." -MSG; # Protocol
    iF -next while
    "\n ${iF.sfile}:" -MSG;
    iF "AH" "F" idFeaAh -FEA_get;
    iF "BH" "F" idFeaBh -FEA_get;
    idFeaAh NULL idFeaAh -LAB_strip;
    idFeaBh idFeaAh -join;
    " -> ${sDout}/${iF.sfile}.${iF.ext} ..." -MSG;
    "${sDout}/${iF.sfile}.${iF.ext}" idFeaAh /zip /noerror -save
    ?error if " FAILED" else " ok" end -MSG;
    end

    "\n done.\n\n// DB.xtp completed (${._UTL_nErrors} errors).\n" -MSG;
    0 return;
}

## Overwrite UASR-functions
"._SIG_import" "function" ?instance if
/disarm -SIG_import_raw /disarm -SIG_import =;
end
"._FEA_import" "function" ?instance if
/disarm -FEA_import_raw /disarm -FEA_import =;
end
end

## EOF
```

3.2 DEFINITIONSDATEIEN

3.2.1 [...]common/info/classes.txt

```
## UASR class definition file
## - IZFP Gear Wheels Thale Database (Recording 1937)
##
## first column: model name
## second column: number of states
## third column: voice/unvoiced information
## fourth column: abstract model for SMG reclassification

OK 10 1.0 - # Wheel ok
UNK 1 1.0 - # Wheel broken

## EOF
```

3.2.2 [...]common/info/sensors.txt

```
## UASR sensor list file
## - IZFP Gear Wheels Thale Database (Recording 1937)
##
## first column: sensor ID

AH
BH

## EOF
```

3.2.3 [...]FEAFUS/info/classes.txt

```
## UASR class definition file
## - IZFP Gear Wheels Thale Database (Recording 1937)
##
## first column: model name
## second column: number of states
## third column: voice/unvoiced information
## fourth column: abstract model for SMG reclassification

OK 10 1.0 - # Wheel ok
UNK 1 1.0 - # Wheel broken

## EOF
```

3.3 KONFIGURATIONSDATEIEN

3.3.1 [...]common/info/feaana.cfg

```
## UASR configuration file
## - IZFP-D Gear Wheels Thale Database (Recording 1937)
## - Feature analysis setup (from Labview TME-files)
## Two classes (OK/UNK)
##
## USAGE:
## FEA.xtp ana [...]feaana.cfg --> Primary feature analysis (128 components)
## FEA.xtp ana [...]feaana.cfg -Ppfa.dim=1024 -Ppfa.cavg=1 --> Primary feature analysis (1024 components)
## DB.xtp feafus [...]feaana.cfg --> Spectrogram fusion of sensors AH and BH

uasr.db = "izfp/cwt1937";
uasr.db.include = ".../data/izfp/cwt1937/common/info/cwt1937.itp";

## Labview signal import
uasr.dir.sig = "$UASR_HOME/data/izfp/cwt1937/volumes/1937_280802_1/tme";
uasr.sig.gain = 0.9;
uasr.sig.aquant = 16;
uasr.sig.srate = 250000;
uasr.sig.ext = "tme";
uasr.import.raw.header = 28672;
uasr.import.raw.dtype = "float";
uasr.import.raw.byteorder = "";
uasr.import.raw.nrec = 17408;

## Primary feature extraction settings
uasr.fea.ext = "dn3";
uasr.fea.savecompressed = FALSE;
uasr.pfa = "lmag";
uasr.pfa.dim = 128;
```

```

uasr.pfa.cavg          = 8;
uasr.pfa.crate         = 285;
uasr.pfa.len           = 2048;
uasr.pfa.wlen          = 2048;
uasr.pfa.FFT.order     = 11;
uasr.sfa               = "pca,red";
uasr.sfa.dim           = 20;

## EOF

```

3.3.2 [...]common/info/feaimp.cfg

```

## UASR configuration file
## - IZFP-D Gear Wheels Thale Database (Recording 1937)
## - Feature import setup (from Labview SON-files)
##
## USAGE:
##   FEA.xtp imp [...] /feaimp.cfg          --> 128 primary feature components
##   FEA.xtp imp [...] /feaimp.cfg -Ppfa.dim=1024 -Ppfa.cavg=1 --> 1024 primary feature components
##   DB.xtp feafus [...] /feana.cfg         --> Spectrogram fusion of sensors AH and BH

uasr.db               = "izfp/cwt1937";
uasr.db.include       = ".../data/izfp/cwt1937/common/info/cwt1937.itp";

## Labview feature import
uasr.import.pfa.dir   = "$UASR_HOME/data/izfp/cwt1937/volumes/1937_280802_1/son";
uasr.import.pfa.ext   = "son";
uasr.import.pfa.header = 0;
uasr.import.raw.dtype = "float";
uasr.import.raw.byteorder = "reverse";
uasr.import.raw.dim   = 1024;
uasr.import.raw.rinc  = 1.14;
uasr.import.raw.cunit = "kHz";
uasr.import.raw.cinc  = 0.1220703125;
uasr.fea.ext          = "dn3";
uasr.fea.savecompressed = FALSE;
uasr.pfa              = "lmag";
uasr.pfa.dim          = 128;
uasr.pfa.cavg         = 8;

## EOF

```

3.3.3 [...]common/info/ccc.cfg

```

## UASR configuration file
## - IZFP-D Gear Wheels Thale Database (Recording 1937)
## - CCC setup
##   Two classes (OK/UNK)
##
## USAGE:
##   XVL.xtp ccc [...] /hmm.cfg --> CCC cross validation
##   CCC.xtp trn [...] /hmm.cfg --> CCC training and assessment

uasr.db               = "izfp/cwt1937";
uasr.db.include       = ".../data/izfp/cwt1937/common/info/cwt1937.itp";

## Feature settings
uasr.fea.ext          = "dn3";
uasr.fea.savecompressed = FALSE;
uasr.pfa              = "lmag";
uasr.pfa.dim          = 1024;

## CCC settings
uasr.ccc.windows.AH   = 5; # number of windows
uasr.ccc.window.AH1   = " 0, 0, 0, 0, 10"; # That is: entire spectrogram!
uasr.ccc.window.AH2   = " 0, 0,42,44, 10"; # [ms, ms, kHz, kHz, Gewicht]!
uasr.ccc.window.AH3   = " 0, 0,20,24, 10"; # [ms, ms, kHz, kHz, Gewicht]!
uasr.ccc.window.AH4   = " 0,34,25,52,55, 10"; # [ms, ms, kHz, kHz, Gewicht]!
uasr.ccc.window.AH5   = " 0,25,75,80, 10"; # [ms, ms, kHz, kHz, Gewicht]!
uasr.ccc.windows.BH   = 5; # number of windows
uasr.ccc.window.BH1   = " 0, 0, 0, 0, 10"; # That is: entire spectrogram!
uasr.ccc.window.BH2   = " 0, 0,18,22, 10"; # [ms, ms, kHz, kHz, Gewicht]!
uasr.ccc.window.BH3   = " 0,30,56,60, 10"; # [ms, ms, kHz, kHz, Gewicht]!
uasr.ccc.window.BH4   = " 0,25,68,72, 10"; # [ms, ms, kHz, kHz, Gewicht]!
uasr.ccc.window.BH5   = " 0,50, 2, 4, 10"; # [ms, ms, kHz, kHz, Gewicht]!

## Assessment and cross validation settings
uasr.am.eval.assess   = "loghist";
uasr.xvl.test         = 310;

## EOF

```

3.3.4 [...]FEAFUS/info/hmm.cfg

```

## UASR configuration file
## - IZFP-D Gear Wheels Thale Database (Recording 1937)
## - HMM setup
##   Two classes (OK/UNK)
##   Feature fusion of sensors AH and BH

```

```

##
## USAGE:
##   XVL.xtp hmm [...]hmm.cfg --> HMM cross validation
##   HMM.xtp trn [...]hmm.cfg --> HMM training and assessment

uasr.db                = "izfp/cwt1937";
uasr.exp               = "FEAFUS";
uasr.db.include        = ".../data/izfp/cwt1937/common/info/cwt1937.itp";

## Feature settings
uasr.fea.ext           = "dn3";
uasr.fea.savecompressed = FALSE;
uasr.pfa               = "lmag";
uasr.pfa.dim           = 256;
uasr.sfa               = "pca,red";
uasr.sfa.dim           = 20;

## HMM/GMM settings
uasr.skip              = "T";
uasr.flist.stat_t      = "stat.flst";
uasr.am.train          = "baum-welch";
uasr.am.train.split    = 2;
uasr.am.train.ite0     = 1;
uasr.am.train.ite1     = 2;
uasr.am.train.ite2     = 4;
uasr.am.model          = "0_0";

## Assessment and cross validation settings
uasr.am.eval.assess    = "loghist";
uasr.xvl.test          = 310;
#uasr.xvl.flist.stat    = "stat.flst";
#uasr.xvl.flist.stat_t  = "stat.flst";

## EOF

```

3.3.5 [...]FEAFUS/info/svm.cfg

```

## UASR configuration file
## - IZFP-D Gear Wheels Thale Database (Recording 1937)
## - HMM setup
##   Two classes (OK/UNK)
##   Feature fusion of sensors AH and BH
##
## USAGE:
##   XVL.xtp svm [...]hmm.cfg --> SVM cross validation
##   SVM.xtp trn [...]hmm.cfg --> SVM training and assessment

uasr.db                = "izfp/cwt1937";
uasr.exp               = "FEAFUS";
uasr.db.include        = ".../data/izfp/cwt1937/common/info/cwt1937.itp";

## Feature settings
uasr.fea.ext           = "dn3";
uasr.fea.savecompressed = FALSE;
uasr.pfa               = "lmag";
uasr.pfa.dim           = 256;
uasr.sfa               = "";
#uasr.sfa               = "pca,red";
#uasr.sfa.dim           = 20;

## SVM settings
uasr.svm.sig           = FALSE;
uasr.svm.sv            = TRUE;
uasr.svm.kernel        = 0;
uasr.svm.C             = 10;

## Assessment and cross validation settings
uasr.am.eval.assess    = "loghist";
uasr.xvl.test          = 310;
#uasr.xvl.flist.stat    = "stat.flst";
#uasr.xvl.flist.stat_t  = "stat.flst";

## EOF

```

3.4 DATEILISTEN

3.4.1 [...]common/flists/all.flst

```

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3.4.2 [...] /common/flists/xval.flst

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| 00337 | OK |
| 00445 | OK |
| 00233 | OK |
| 00038 | OK |
| 00595 | OK |
| 00558 | OK |
| 00486 | OK |
| 00164 | OK |
| 00322 | OK |
| 00189 | OK |
| 00529 | OK |
| 00458 | OK |
| 00115 | OK |
| 00232 | OK |
| 00284 | OK |
| 00400 | OK |
| 00106 | OK |
| 00267 | OK |
| 00264 | OK |
| 00548 | OK |
| 00374 | OK |
| 00228 | OK |
| 00462 | OK |
| 00441 | OK |
| 00606 | UNK |
| 00073 | OK |
| 00376 | OK |
| 00186 | OK |
| 00120 | OK |
| 00334 | OK |
| 00619 | UNK |
| 00005 | OK |
| 00139 | OK |
| 00504 | OK |
| 00270 | OK |