

\$SSOLFDELOLW\ RI LQIRUPDWLRQ V
GHVLJQ DQG RSHUDWLRQ RI ZDWH
ZDVWHZDWHU V\ VWHPV LQ 5XVVD D

9LDFK %DDEFDXNG XEKLORYD
0RVFRZ 6WDWH 8QLYHUVLW\ RI &LYLO (QJLQHHULQJ <DURVOD

\$EVWUDFHW DUWLFOH H[DPLQHV WKH UROH RI LQIRUPDWLR
GHVLJQ DQG RSHUDWLRQ RI ZDWHU VXSSO\ DQG ZDVWHZ
WKH KLVWRU\ RI WKH ZDWHU VXSSO\ GHYHORSHPHQW LQ 5
FHQWXULHV \$W WKH VDPH WLPH WKH ILUVW XUEDQ ZDV
GHYHORSHG MRLQWO\ E\ DUFKLWHFWV DQG HJLQHHUV
SURMHFW GHYHORSHPHQW WDNHV PFK OHVV WLPH VLQ
LQIRUPDWLRQ WHFKQRORJ\ KDV EHRPH DQ LQWHJUDO S
VLJQLILFDQWO\ LPSURYLQJ WKH HILFLHQF\ DQG TXDOLW
IXQFWLRQDO ZDV DQDO\]HG DOJRULWKP IRU DGGLQJ
HJLQHHULQJ HTXLSPHQW LV SURSRVHG

, QWURGXFWLRQ

7KH KLVWRU\ RI WKH ZDWHU VXSSO\ GHYHORSHPHQW LQ 5XV
H[FDYDWLRQV FDUULHG RXW RQ WKH WHUULWRU\ RI 9HOL
GLVFRYHUHG GLYLGHG LQWR D JUDYLW\ ZDWHU VXSSO\
GUDLQDJH DSSUR[LPDWHO\ ; ; ; , FHQWXULHV DQG E\ WK
ZHUH SURYLGHG VRPH FUDIWV \$W WKDW WLPH WKHUH ZH
RI ZKLFK ZRRGHQ YDOYHV ZHUH XVHG \$W WKH HQG RI W
DSSHUHG LQ 0RVFRZ SDUHG WKHUH ZDWHU VXSSO\ V\ VWHPV LQ
LQ WKH WK FHQWXU\ /DWHU DOO UR\DO SDODFHV ZHUH
OHDG DQG FRSSHU SLSHV \$QG RQO\ DW WKH EHJLQQLQJ R
VXSSO\ V\ VWHPV DSSHUHG IRU WKH WRZQVSHRSOH LWV
0\WLKFKL WR 0RVFRZ 0RUH WKDQ FLWLHV UHFHLYHG F
EXLOGLQJV E\ DQG E\ FLWLHV RI WKH 8665 KD
V\ VWHPV

7RGD\ QHZ PDWHULDOV DQG WHFKQRORJLHV DUH DFWL
LPSURYH WKH TXDOLW\ RI VHUULFH WR ZDWHU FRQVXPHU
ZDWHU VXSSO\ DQG VDQLWDWLRQ V\ VWHPV XUEDQ ZDWHU
SURMHFWV ZHUH GHYHORSHG MRLQWO\ E\ DUFKLWHFWV
SURMHFW GHYHORSHPHQW WDNHV PFK OHVV WLPH VLQ

&RUUHVSRRQ [GDEJDXWKROUD](https://doi.org/10.1051/bioconf/202410701001) #PDLO UX

WHFKQRORJ\ ,7 KDV EHFRPH DQ LQWHJUDOO SDUWLRS YDYL
 WKH H4FLHQF\ DQG TXDOLWHORGSUBFRVLYVGDQGRSHUDWLR
 DQG ZDVWHZDWHU V\ VWHPV ZKHUH KLJK DFFXUDF\ UHOL
 LQWURGXFWRQ RI LQIRUPDWLRQ PRGHOOHQJ WHFKQR
 WUDQVIRUPDWLRQ RI WKH FRQVWUXFWLRQLQG XWU\
 7KH XVH RI LQIRUPDWLRQ V\ VWHPV ,6 LQWKLVDUHD SU
 DQG SURFHVV PDQDJPHHQW DW DOO VWDJHV RI WKH SURMH
 FRRUGLQDWLRQ DQG V\QFKURQL]DWLRQ RI ZRUN LV DFKL
 FRQVWV DQG HUURUV
 ,I ZH FRQVLGHU WKH GRPHVWLF H[SHULHQFH LQ GHYHO
 WHFKQRORJ\ LQ WKH GHVLJQ DQG RSHUDWLRQ RI ZDWHU V
 QRWHG WKDW VLQFH D FRXUVH KDV EHHQ WDNHQ WR
 ZKLFK LV FRQ1UPHGE\ UHJXODWLRQV
 7KH PRVW XVHG SURJUDPV DW SUHVHQW DUH VXFK SURJ
 XVHG IRU WKH GHVLJQ DQG FDOFXODWLRQ RI PRGHOOV RI L
 H[WLQJXLVQLQJ V\ VWHPV DQG 5HQJD VRIWZDUH
 :LWKLQ WKH IUDPHZRUN RI WKH SUHVHQWHG DUWLFOH
 DSSOLFDELOLW\ RI 5HQJD VRIWZDUH IRU WKH GHVLJQ DQG
 RXW

0DWHULDOV DQG PHWKRGV

\$V SDUW RI WKH SUHVHQWHG VWXG\ 5HQJD VRIWZDUH ZD
 SUREOHPV RI DQ DUFKLWHFW GHVLJQHU DQG HQJLQHUU
 PRGHOOHQJ WHFKQRORJLHV 7KH VRIWZDUH SURYLGHV XV
 IXQFWLRQDOLW\ DQ LQWXLWLYHLQWHUIDFH DQG DQ D3R
 7KH V\ VWHP LV EDVHG RQ WKH 5XVLDQ PDWKHPDWLF
 /DEV 7KH VROXWLRQ KDV SRZHU IXO WRROV IRU PRGHOO
 FRPSOH[LW\ FDOFXODWLQJ FGDUDFWHULVWLFV FRQVW
 H[FKDQJLQJ GDWD ZLWK RWKHU V\ VWHPV > @ \$V SDUW RI V
 ZDV PDGH RI LWV DSSOLFDELOLW\ LQ WHUPV RI GHVLJQLQ
 OD\LQJ URXWHV DQG DUDLQJLW\ LQ SUHODWLRQ PRGHO
 RI FDOFXODWLRQV DQG V\ FLXULQJ FROODERUDWLRQ R
 GRFXPHQDWLRQ

5HVXOWV

7KH IXQFWLRQDOLW\ RI WKH 5HQJD V\ VWHP LQYROYHV WK
 LQWHUQDO ZDWHU VXSSO\ DQG VDQLWDWLRQ V\ VWHPV
 SXUSRVHV 6RIWZDUH WRROV DUH XVHG WR DXWRPDWH PR
 DV OD\LQJ ZDWHU DQG VHZHU OLQHV SRSXODWLQJ PRGHO
 DQG REWDLQLQJ GUDZLQJ GRFXPHQDWLRQ > @
 7KH GHVLJQ SURFHVV RI LQWHUQDO ZDWHU VXSSO\ DQG
 RUJDQLJHG DFFRUGLQJ WR WZR VFHQDULRV
 &UHDWLQJ DQ LQIRUPDWLRQ PRGHOOHQJ RQR'GHU
 XWLQW\ QHWZRUN REMHFVV
 ORGHOOHQJ RI HQJLQHULQJ V\ VWHPV LQ D WKUHH GLF
 SDUDOOHO ZRUN RI VHYHUDO VSHFLDOLVVV

7KH \$XWRPDWLF 5RXWLQJ WRRO DOORZV WR FUHDWH F
FRQVWUXFWLRQ RI URXWHV IRU LQWHUQDO ZDWHU VXSSO
VHTXHQFH RI FRQQHFWLQJ REMHFV DV ZRRO DQWZDORQ
DUH VHW LQ D VSHFLDO W6\ VWHP 'HVLJQHUX PRGH ZKLFK
GHHUPLQLQJ WKH RSWLPDO WVEDWV DQ IRVLSHU HOOHPRZ
DFRXQW SDUDPHWHUV VXFK DV KHLJKW VORSH SLSHGLD
(TXLSPHQW SODFHPHQW LQ VRIWZDUH FDQ DOVR EH
VFHQDULRV /HW VORRNDW WKH PDLQ RQH V
,Q WKH VFHQDULR SDUDPHWULF HTXLSPHQW VW\OH
RI HTXLSPHQW 7KH SURJUDP LPSOHPHQWV D XQLYHUVDO
WKH QHFHVVDU\ W\SHV RI HTXLSPHQW IURP DQ\ PDQXID
HTXLSPHQW VW\OHV ZKLFK FDQ EH IRXQG LQ WKH PDLQ SD
,Q PRUH UHFHQW YHUVLRQV 5HJRW\H W\HRSFODLQHV
ODQJXDJH KDV EFRPH DYDLODEOH ZKLFK LQFOXGHV EX
WHPSODWHV DQG DOORZV WKH XVH RI WKH -621 IRUPDW W
WKLV FDVH WKH DOJRULWKP IRU DGGLQJ D QHZ FDWHJRU
UHSUHVHQWHG DV D SURFHVV VKRZQ LQ)LJ

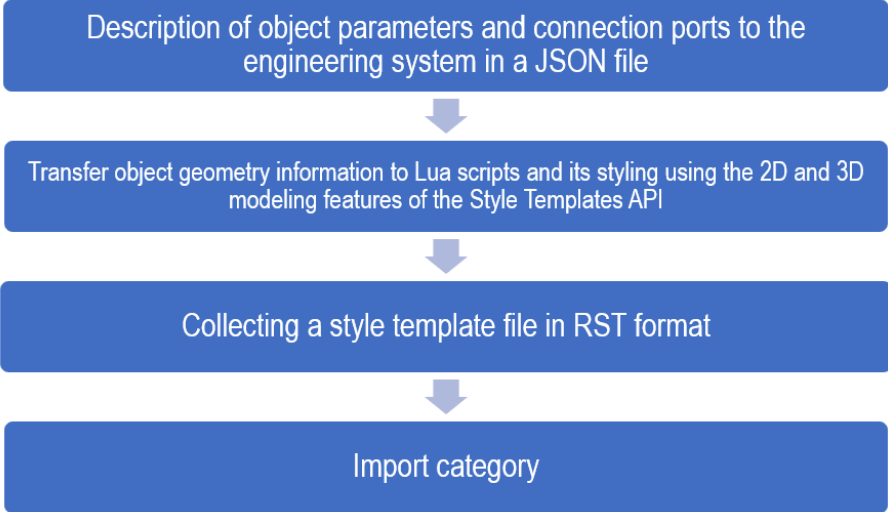


Fig.1. \$OJRULWKP IRU DGGLQJ D QHZ FDWHJRU\ RI HQJ

,Q WKH VHFRQG VFHQDULR \RX FDQ XVH WKH DVVH
LQGHSHQQGHQWO\ FUHDWH HTXLSPHQW WKDW LV QRW SUH
H[DFW GLPHQVLRQV 1HWZRUN WUDFLQJ ZLOO EH H[GUULH
E\ WKH VSHFLDOLVV
,Q DQRWKHU VFHQDULR \RX FDQ XVH UH DG\ PDGH FDV
RQ WKH GHYHORSHUVV ZHEVLWH
\$V SDUW QDW\ VFHQDULR \RX FDQ XVH UH DG\ PDGH
WR DGG WUDFH SRLQWV DQG FRQQHFV WR WKH XWLWLW\ Q
7KH SURJUDP SURYLGHV IXQFWLRQDOLW\ IRU HQWHULQJ
IRU HDFK HOHPHQW RI WKH PRGH IRU VXEVHTXHQW XVH E
WKH XVHU FDQ TXLFNO\ REWDLQ WKH QHFHVVDU\ LQIRUPD
SUHPLVHV WKH SRVLWLRQ RI VKDIWV IRU XWLWLWLHV WK

,Q DGGLWLRQ WKH SURJUDP FDQ SHUIRUP HQJLQHHULQ
 LQFOXGLQJ FDOFXODWLRQV RI ZDWHU FRQVXPSWLRQ D
 FDOFXODWLRQ RI KHDW ORVVHV XVLQJ WKH SURJUDP IRU
 VHZHJDJH V\VWHPV RI EXOLOGLQJV W6PDUW :DWHUX > @
 7KH FRPSDQ\ R3HUV D VFRVLRQDOO WKG DVS B DORZV \RX WR
 DOO DVSHFWV RI LQWHUQDO ZDWHU VXSSO\ DQG VHZHJDJH
 FROOHFWV LQIRUPDWLRQ IURP PRGHO REMHFWV DQG JHQ
 DFFRUGLQJ WR WKH VWDQGDUGV LQ IRUFH LQ WKH FRXQW
 6SHFDWLRQV DUH DVVRFLDWHG ZLWK WKH ' PRGHO DQG
 FKDQJHV DUH PDGH WR WKH PRGHO
 7KH SURJUDP DOORZV \RX WR FUHDWH GRFXPHQWDWLRQ
 V\VWHPV WKDW PHHW FXUUHQW VWDQGDUGV RI WKH 5XVVL
 7R HQVXUH WKH FROODERUDWLRQ RI VSHFLDOLVWV 5H
 ZKHUH SURMHFW SDUWLFLSDQWV FDQ OHDYH FRPPHQWV
 RWKHU SDUWLFLSDQWV (DFK RI WKHP FDQ YLHZ DQG HGL
 FKDQJH VWUXFWXUDO HOHPHQWV DV ZHOO DV FUHDWH I
 FKDQJHV PDGH E\ HDFK SDUWLFLSDQW DUH DXWRPDWLF
 SURMHFW SDUWLFLSDQWV 7KLV DOORZV \RX WR H3HFWLYH
 DQG HQVXUH KLJK TXDOLW\ RI WKH SURMHFW
 7R VLPSOLI\ WKH RUJDQLJDWLRQ RI D FRPPRQ LQIRU
 FRPSUHKHQVLYH VROXWLRQ IURP \$6&21 3LORW %,0 LV SU
 %,0 PRGHV FURHHQGLQJ V\VWHPV LQWR D FRQVROLGDWHG
 GDWD H\FKDQJH 7KH VROXWLRQ DOVR DOORZV \RX WR FR
 SURMHFW SDUWLFLSDQWV ERWK ZLWKLQ WKH JURXS DQ
 V\VWHPV)RU LQIRUPDWLRQ H\FKDQJH LW LV DOVR SRV
 IRUPDWV ZLWK &\$' V\VWHPV
 +RZHYHU WKH SURJUDP XQGHU FRQVLGHUDWLRQ LV FX
 EXOLOGLQJV DQG VWUXFWXUH EXW LQ WKLV VRIWZDUH I
 VDQLWDWLRQ V\VWHPV WKDW FDQ EH XVHG IRU DQDO\VLV
 WKH YROXPH RI ZDWHU UHTXLUHG IRU WKH RSHUDWLRQ RI V

&RQFOXVLRQV

7KH DUWLFOH H[DPLQHV WKH UROH RI LQIRUPDWLRQ WHF
 ZDWHU VXSSO\ DQG ZDVWHZDWHU V\VWHPV IRFXVLQJ RQ
 5HQJD V GHVLJQ DQG RSHUDWLRQ DQDWDSDGYDQWIDJH V\BY
 V\VWHP (YHQ WKRXJK WKH XVH RI 5HQJD LV FXUUHQWO\ C
 VWUXFWXUH WKLV DSSURDFK LDIW OAKID XW WKH FRPSDQ
 RYHUORDG XVHUV ZLWK D YDULHW\ RI IXQFWLRQDOLW\ S
 UHODWHG SURJUDPV 7KLV DSSURDFK FRQWULEXWHV WR
 HQVXUH LWV VWDELOLW\ DQG IXQFWLRQDOLW\ 7KXV V
 VROXWLRQV GHPRQVUDWLQJ WKH RSWLPDO FRPELQDWI
 GHVLJQ DQG RSHUDWLRQ RI ZDWHU VXSSO\ DQG ZDVWHZDW

5HIHUUHQFHV

1. & ' 7RRNLW \$ VHW RI WRROV IRU GHYHORSHUV RI
 KWWSV VWDWLF LFW PRVFRZ VLWHV GHIDXOW ILOHV
 DFFHVVG

2. 3UDFWLFD O 5HQJD XVHU JXLGH 85/ KWWSV PDQ
3. 5HQJD 67'/ PDQXDO 85/ KWWSV KHOS UHQJDELP F
DFFHVVHG
4. 5HQJD 67'/ FUHDWLRQ RI QHZ FDWHJRULHV RI HQJL
3URIHVVLQRDO 85/
KWWSV EORJ UHQJDELP FRP UHQJD VWGO UHQ
5. 5HQJD 67'/ DEULHIRYHUYLHZ RIWKH ODQJXDJH IRU H[
5HQJD SURJUDP 85/ KWWSV KDEU FRP UX FRPSDQL
DFFHVVHG
6. &DOFXODWLRQV RILQWHUQDO ZDWHU VXSSO\ DQG VDQL
6PDUW :DWHU 85/ KWWSV UHQJDELP FRP DSSOLF
7. 1HZ 5HQJD UHOHDVH UHGXFQJ SURMHFW WLPH ZLV
KWWSV DVFRQ UX QHZVBDQGBHYHQWV QHZV GD
8. 3LORW *XLGH ± %,0 85/
KWWSV SLORWHPV FRP VRXUFH LQIRBPDWHULDOV XV
RW ELP SGI DFFHVVGDWH