

!''#\$%&'()*'+,-.:/0'-%-(1&1'!(0&+-)2+,0!21,,%2'!)&(11!&+3)*+')1&(+'+!(#%!
'1!4%)\$!%)&2%1&!/+'%,,'%5(%.%&(%&'!%24&1,1*)%/6!''1&/%7#%&',08!()*)'+,-. /!'%&(!'1!1&,0!
199%\$1#'(11!&+3)*+')1&!/%)3)2%/6!:4%!#. \$1%/19!- 0!.\$1;2'!<+/'1!%/'+=,)/4!+!&%<'!%24&)7#%!
91!+>#'1-+'&*)4%!21&/'\$#2')1&19!)&(11!\$!-+. /6!>0!0/'%-+')2+,0!+22%/)/&*/%&/1\$/!9\$1-!
-1=),%!(%3)2%/!'1!2\$%+%8!21,,%2'8!+&(!.+\$%/!#/%!&+3)*+')1&(+'+8!'!+'-%. '%(!'1!-+@%)&(11!\$!
()*)'+,-. .) &*/+'%,,)'59\$%8!+>#'1-+')28!(0&+-)28!+&(121&'\$1,,%(6!:4)!/1,#')1&-+0!=%&%9)!
/%\$3)2%/!\$%7#)\$&*!.\$1!\$@&1<,(%*'19!.\$)3+ '%!#=\$+&/'\$#2'#\$%!//#24!+!9)\$%9)*4*)&*!+&(,+<!
&91\$2%- %&'8!+&(!.\$13)(%&+3)*+')1&!/#..1\$!91\$!3)/#+,0!-+)\$%(!&()3)(#+,/6!
:1!+24)%3%'4)/!*1+,8!?!)-. %-%&'(!+!0/'%-!'4+!(%'2'/!+&(!\$%)'/%'\$/!/-+,,!/?2+,%!
&+3)*+')1&(<)'41#'\$!%)&2%!1&!A,1=+,!B1/!')1&)*!CO!/'- !DABCE6!/?%+(8!-0!0/'%-\$!%)!1&'4%!
user device's accelerometer, gyroscope, and magnetometer to dynamically construct virtual
'\$+;2'1\$)/6!F)/'+&2%/!+&(!())\$2')1&!/+\$%!/!'!9\$1-!'4!!=%4+3)1\$!19!'4%!/%%&/1\$/8!+&(9!1!%+24!
21,,%2'1&!/%/)/1&8!4%/!&+3)*+')1&(+'+121,,+.%!)&'1!+!. +'4G!*%1-%\$)2+,08!+9,1+')&*)&%)1&+!
-%\$)25=+/%(12+\$%/+&!*\$)(6!B+'4!21&'\$#2')1&!/1&,0!+2')3+%(!<4%&8!#/) &!*A11*,%!/%)3)2%/8!'4%!
0/'%-%!(%'%2'/!+124+&*&!)&!/#\$!,12+'1&19\$1-!1#'(11\$!'1!)&(11!\$6!:4)!%&/#\$/!'4+'!%+24!2\$%+%'(!
. +'4!)/!+'%,,)'59\$%8!+&(12+&!=%!+//)*&%'1!'/!+'%,,)'5(%.%&(%&'!41/'!=#),()&*6!
:1!\$%)&91\$2%'4!3+,)()0!19!'4%9)&+!(+'+8!'4%!0/'%-!#%/!2\$1<(/1#2)&*!1!)-.\$13%!)!/
+22#\$+206!:4%\$91\$8!%+24!=#),()&*!)/!21&&2%'(!'1!+. 11,!19!. +'4/!)&2\$%- %&'+,0!9),%(9\$1-!
(99%\$%&'!#/%\$/6!B+'4!21,,%2'1&!/!)'4%\$!2\$%+%'!&%<!\$!21-. %-%&'\$0!)&%/6!:4%!.'4!)/!%&'!1!
)'/!+//12)+%(!. 11,!D<4)24!)/!)&@%'1!4%!/'2)9)2=#),()&*13)+()*)'+,-. .) &*'8!%6*6!-+. .) &*'9\$1-!
A11*,%!H+. /! B?/E8!+&(!)9!+!/-),+\$!. +'4!)/!+,%+(0!/+3%(!)&'4%!.'11,8!'4%!.\$1=+=),)0!'4+'!4%!
=#),()&*121&'&)/!+!4+,!1\$!+!21\$\$)(1\$!+/'4+'!. +'4!)/!)&2\$%+/%(6!J'4%\$<)/%8!'4%!&%<!. +'4!)/!+((%'!
'1!4%!.'11,!<)'4!+!,1<!. \$1=+=),)0!19!%K)/%'&2%!)&'4!=#),()&*6

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