The OpenGL ES Shading Language

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! " # "$ " " %" " " &
" % %" # & # & # & " % & " &
" " $ ' " %" $ ' $ % !
(%" ! " ! % % ! " & $ "

Table of Contents

- % _____ ,
- , _____7_____ , .
- - 7 ; 4 _____

1 Introduction

"# $$ # < / "#$# $ $$#= 1 "#$

-) ' ! ! ! 1 ! *
- ! ! *
- $ * D ! ' D ! ! *
- $ * 1 1 *
- ' * 1
- ! * / *
- 9 1 • ; ' $!* ¡ ' À á Ø$

- * * * * ' * * ' 1 ! * %D * * * * ' * * '; ! *; * ! * . %
- 5 * 4 '
- (* * * !
- " ! *<= * ! ';! ! ! *<=
-) '<=D) <=D ! <= *

1.2 O er ie!

* 1

2 O er ie! of OpenGL ES Shading

"# $$ #
! ** 1 "# $

")asics

".1 Character Set

! "# $ 1 !3$ < C
J6 * 5 ! J= ! C

D <>=

*1

*1 <=D <=D <

+ ! D * ! * * * D ** D *
! * ! * ! 3 ' 1 * ! 1
1 4 1 ! * '
3 <

```
#extension extension_name : behavior
#extension all : behavior
```

D. %2d'W e-tension(name 0 ` 0 * 0

! * !

#extension all % disa$le

D * * 1
! D '

' ! ! ! D
* D ' * 1 ! ; / !

".- To.ens

A ! / 3 / 1

to2en:

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identi)ier
integer$constant
*)l*oating$constant
o"erator

"./ 0ey!ords

! / D 1 !
! 1 ð 0 C Uc 2 ôó ã *f*

9 ="

: 6" "# " 7

: 6" "# "

1 ' * <1 -=) <1 %=) ' * <1 =
!

integer$constant :
decima1$constant

#.1.# 'loats

: 6" "# "

```
ve'2 tex'oord3/ tex'oord2*
ve'6 position*
ve'1 m7RG-8*
ive'2 textureLoo9up*
$ve'6 less (an*
```

? ! 1 D

#.1.- **2**atrices

2 ! * D "# $$ #
! ! × D × D ×

struct$de)inition :
*5*ua*1*i)iers$_{o"t}$ name$_{o"t}$ **(** member$*1*ist **)** dec*1*arators$_{o"t}$ *6*

member$*1*ist :
member$dec*1*aration*6*
member$dec*1*aration member$*1*ist*6*

member$dec*1*aration :
basic$ty"e dec*1*arators*6*

name

: 6" "# "

: 6" "# "

* * * * ! ! ! * 1 !

& 1 ! ' * C

var7ing ve'6 normal*

> A ! 1 D @D AD BD @D AD

B

'loating &oint 2agnitude 5ange ! * ! ;?)
'loating &oint &recision& * ! * D

' ! 1 ! * (

```
pre'ision (ig(p float*
pre'ision (ig(p int*
pre'ision lo;p sampler2!*
pre'ision lo;p samplerDu$e*
```

! * ! 1 ! * (

```
pre'ision
```

: 6" "# " 9

#.-."

, Operators and E%pressions

,.1 Operators

; . " " 1' :7

,.2

; . " " 1 ' :

,.#.2 $ector and 2atri% Constructors

1 * ! * ! D D *

1

; . " " 1' :

,./

; . " " 1' :<

.

; . " " 1' ;7

3

mat m/ n/ r*

r . m A n*

- State (ents and Structure

! * 1 1 / ! "# $$ # (

- *
- ! !
- <
-

```
sim"le$statement:
    dec!aration$statement
    e-"ression$statement
```

3 " % " 3 ; :

3 " % " 3 ; ;

3 " % " 3 ;

name :
*
!
array$s"eci)ier :
*
& integra1$constant•mos"ea1D

3 " % " 3 ;8

$ $, J$ # " * * K (0# 0 @(p$# 0°

K à ±3ÐUŸ?K! / TÐŸK # # 0 @$ • € €

S@ S / %aDaP ! * 1 ! *
1 ă

8 = 6" "#

/.2 'rag(ent Shader Special $ariables

! ! * 1 !' 1• Q . qQ0 . q. ! 0+ 0 ` ! Se3A

1(> ? 8 = 6" "# 7

! * ; 1 ; 1 g1(>oint?oord
g1(>oint?oord ; *
! * ! * - - - 1 *
$ + (5 ? ° €€ [p ` ð p p*ñ

1)uilt<in 'unctions

"# $$ # ! * !1 ; ! !

< = 0 :

1.1 ***** ngle and Trigono **(** etry **'** unctions

< = 0

1." Co ((on ' unctions

* ; *

< = 0 8

< = 0

Synta%	**4**escription
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< = 0 8

1. **-**

< = 0 87

1./ Te%ture Loo.up 'unctions

< = 0 8

3

```
logical-or-expression:
    logical-and-expression
    logical-or-expression OR logical-and-expression

logical-and-expression:
    logical-or-expression
    logical-and-expression AND logical-or-expression

conditional-expression:
    logical-or-expression
    logical-or-expression ? expression : conditional-expression

assignment-expression:
    conditional-expression
    unary-expression assignment-operator assignment-expression

assignment-operator:
    =
    *=  /=  %=  +=  -=  <<=  >>=  &=  ^=  |=
```

3 " 4" " "%%"

3 " 4" " "%%" 8

3 " 4" " "%%"

struct(declarator(list:
struct(declarator
struct(declarator(list ?+MMF struct(declarator

struct(declarator:
.DE/*.0.ER
.DE/*.0.ER LE0*(GRF?&E* constant(e-"ression R. , H*(GRF?&E* 0È* constae0 0 R. , H*(GRF?&E* 0È*1 E

```
e-"ression(statement:
    !EM.?+L+/
    e-"ression !EM.?+L+/
```

translation(unit:

7 <;

3 A ! 1 ' @

7 ! ' @

C # !

C 9 !

5 $ #9 6C 9 ! ! ! < ! * =

4 A ! ! ! * * @

C _

9 ! * ! 1 ! * ' ! *
* 1 * *

7 <8

! 1 1 A !

! EB; - 1

1:.# 'unction and $ariable 6a(e Spaces

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5 $ #9 6( ) À

7 <

1:.1: 5edefining)uilt<in 'unctions

! 1 ; ! ! D ! 1 ; ! * * @

1:.1, &hases of Co (pilation

$! ! * !

7 9

1:.11 In ariance

7 ;

1 ; 1

```
' *  (
 int f#)
 <
   && no return statement
 =

 444

 int a . f#)*

     (3     !
```

1:."1 g

1:."#

11 Errors

* 1 1 * B /
* * ;

11.1 &reprocessor Errors

(--- C ('
(--- C G

77 1 7 ;

12 **6**or **(** ati e **5**eferences

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$ $ B C ,, ! * ; $;1
! ! * ÐÀ ð°

*ppendi% *C Li(itations for ES 2.:

1 O er ie!

- condition ! *

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  re*l*ationa*l(*o"erator !C % %. $ $. . . /.

- *)*or*(*%eader ! ! ! * C

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